Number 10

EPARTMENT OF ENGINEERING SHOP

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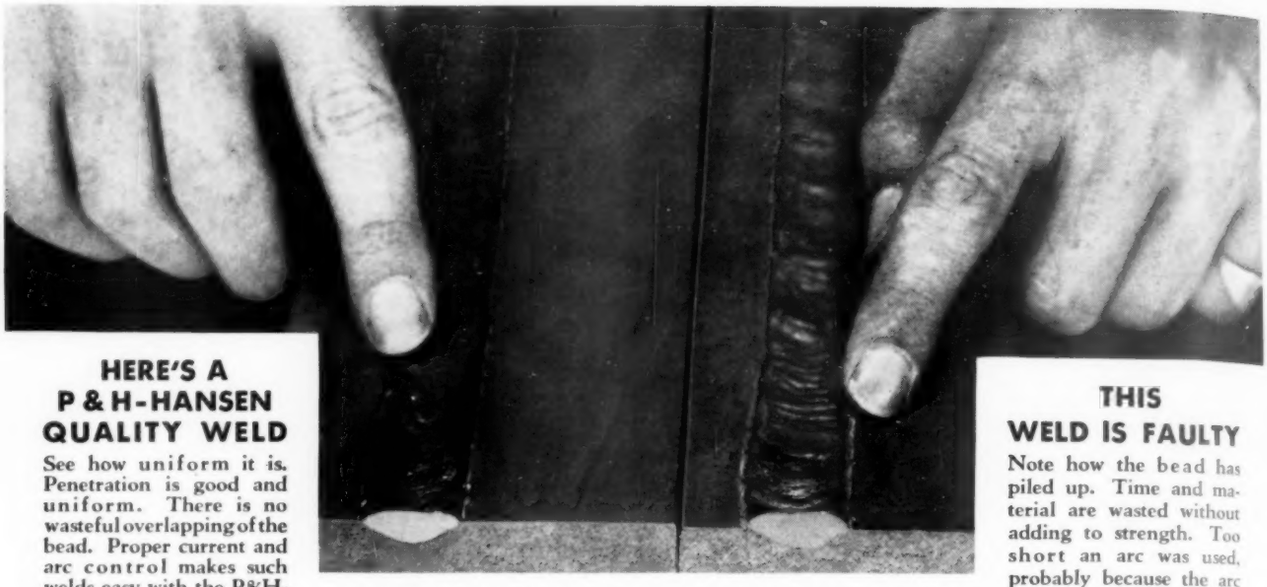
d Technical Journal of the Welding Industry

The Art of Metal Cutng Under Water Has een Demonstrated fore 300,000 Visitors

(See Page 18)

October - 1933



HERE'S A P & H-HANSEN QUALITY WELD

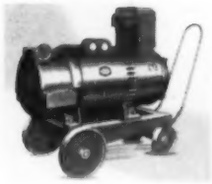
See how uniform it is. Penetration is good and uniform. There is no wasteful overlapping of the bead. Proper current and arc control makes such welds easy with the P&H-Hansen Arc Welder.

NOTE: Both welds were made with heavily coated electrode.

THIS WELD IS FAULTY

Note how the bead has piled up. Time and material are wasted without adding to strength. Too short an arc was used, probably because the arc was sluggish and varying.

STUDY *your* WELDS



Here's How You Can Have Quality Welding

Any man who has learned his A, B, C's in welding will tell you that current control is all-important in quality welding. To be sure, you need a good operator, but fortunately there are plenty available who know their stuff.

P&H-Hansen has been designed for positive, simple current control. You'll find, for instance, that P&H-Hansen far exceeds all standard specifications in assuring uniformity of current flow. This means greater smoothness of weld, more uniform penetration, higher speed and sounder, stronger welds.

In simplicity of design, ease of control, low operating cost, the P&H-Hansen welder is unique. You'll be interested in the descriptive matter contained in our new bulletin *"Weld It Well."* Send for your copy today.

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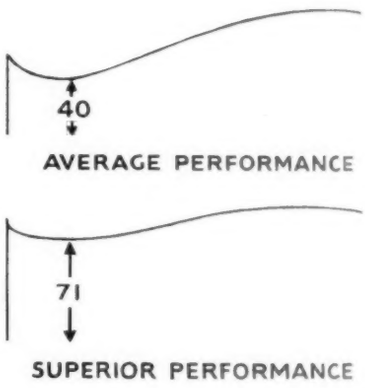
P&H-HANSEN ARC WELDER

AMERICA'S FINEST FASTEST WELDER



Voltage Recovery

Here's graphic evidence of the rapid voltage recovery of the P & H - Hansen. When circuit is opened from short circuit the voltage on a P&H-Hansen falls to but 71 volts and rapidly recovers to normal, while the voltage of the ordinary type of welder falls to approximately 40 volts and gradually increases to normal.

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THE WELDING ENGINEER

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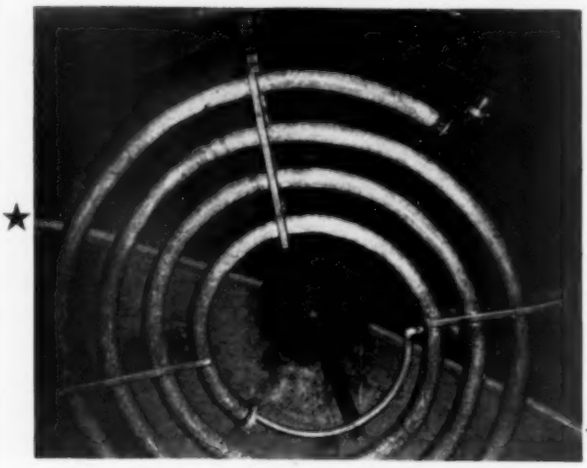

Looking down into 15 ft. dia. brew kettle. Bottom seam and coil-connections were brazed with SIL-FOS

Sil-Fos Brazing Alloy

U.S. PATENT 1,829,903

Ideal for Brazing Copper and Brass Brewery and Distillery Equipment —

★The 500-barrel copper wort kettle illustrated above was installed, recently, in the Frank Fehr Brewery of Louisville, Ky., by Matt. Corcoran & Co., Coppersmiths, of the same city.

The 15-foot scarfed bottom seam, in 1/2 inch copper—shown between the stars—was brazed, by the erectors, in the brewery, with SIL-FOS, in 3 hours—a difficult job made easy by SIL-FOS—a case where the low melting point and free flowing qualities of SIL-FOS were practically indispensable.

Mr. Corcoran, after watching that job, exclaimed: "SIL-FOS is wonderful! I will use it on all heavy copper work from now on."

SIL-FOS—containing silver, phosphorus and copper—flows at 1300° F.—as against 1600 to 2100 degrees, required by other commercial welding rods or brazing alloys.

It requires *no flux* in copper-to-copper joints, and makes strong, tight joints, at a minimum cost for labor and gas.

Coppersmiths who have secured contracts for heavy copper and brass equipment for Breweries, Distilleries, etc., are invited to write us about SIL-FOS brazing, and to send for Bulletin 510W.

HANDY AND HARMAN

82 Fulton Street New York, N. Y.

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· E D I T O R I A L ·

Equipment Sales Remain Encouraging

• An encouraging business sign is the holding-up of sales of welding equipment and recent reported increases in such sales. The welding wire business has been spurting along nicely since early summer—but that was more or less expected. When goods are made by welding or repairs are effected by the arc or the torch, welding rods and electrodes must be consumed—there is no way around it. With torches and arc welders, it's different. There is a tendency in business not to increase invested capital except where it is necessary or where an immediate return in larger profits is in prospect. When plants and shops buy welding equipment of considerable proportions, it is evidence that industry is taking a more optimistic outlook of the future and feels more secure. It's a happy omen—particularly when following the business spurt between March and August which attained almost wild proportions in its dizzy climb to establish new high marks for the past two years. There are those who predict that by next spring there will be a frenzied demand for those particular goods and services that cannot be produced on a moment's notice, with accompanying sky-rocketing of prices. It is dangerous to prophesy—but all concerned can be on their guard by keeping well stocked with raw materials and seeing that their engineering, production and sales organizations are coordinated to hold present business and acquire new accounts through honest sales efforts and personal service.

The National Organization Makes Its Bow

• The first big hurdle has been cleared. The welding shops and contractors now have a national organization that can claim to speak for the industry, and a Code of Fair Competition, drawn up by this national body, is now lying in Washington awaiting the scrutiny of General Johnson. Two months ago there was actually only one or two active welding-shop organizations in the country. In only a few weeks' time the National Industrial Recovery Act (NIRA) has done for the welding shop and welding contractor what he has been unable to do in all previous time—get him organized. Even now, he would still be in a quagmire over what it is all about were it not for a few men who spent liberally of their time and money to get local groups together and to coordinate their activities. These few richly deserve all honors that come their way—and that will be small recompense for the valuable aid they have given the movement. Organization has been the all-important goal. The formulating of a code—important as that task is—has been secondary. The code-making business should be looked at in that light. The immediate danger of discussions over codes is that the fundamental purposes of the new organization will be lost sight of. The new organization will survive and become an indispensable adjunct of the job welding and contracting industry if the membership will ever keep the following in mind: (1) The greatest value that can come from organization is unity of effort. In the case of the new national organization, its efforts aside from code-making will consist of promoting the use of the welding and cutting processes, raising the standards of the welding art, and disseminating necessary and valuable data on costs and technique. (2) No assurance has come from Washington officials that an NRA code on welding is necessary. The idea may *have to be sold to them.* It can't be sold by forcing "just another code" onto industries that are already subscribing to one or more codes. (3) The code idea may fail and the welding contractors be put under one of the existing approved codes. If so, they still have the recourse of entering a formal complaint against code provisions that create an unjust burden, and the national organization can serve a useful purpose in this direction. (4) Code or no code, in the national organization lies the only chance to obtain coordinate action to raise the standards of the industry and help the shop owner and welder alike.

Flame Cutting and Welding Steals the Show

• Welding and flame cutting stole the show at this year's National Metal Exposition at Detroit—just as they did at Buffalo last year. The crowds comprising the curious, as well as those who really were interested in a business way, had some of the demonstrators at their wits' end trying to give them service. Machine cutting with the torch goes hand-in-hand with the welding processes. They are playing a big part in to-day's industrial picture by making for better and cheaper products. Though much has been done recently in making improvements, the manufacturer of flame-cutting machines can well concentrate more attention to the design of the guiding head with the aim in view of using templets that will effect a saving in time and cost in their construction. When templets can be made cheaply and quickly, much of the present hand-guiding will be replaced with automatic means, and the shape as it comes from the cutter will require less time for finishing.

The Picture Is Pretty, But Not True to Life

• The fellow who really believes that the manufacturers of boilers or domestic refrigerators, the piping contractor, the boiler repair shop, the shipyard, the foundry, the structural shop, and the job welding shop, can all be made to operate their welding departments under one Code of Fair Competition, either doesn't know the industrial set-up outside his particular shop or industry, or he is an optimist of the first magnitude.

"I like the G-E WELDER . . . and I'll tell you why"

"I like the G-E arc welder very much better than our other equipment", says J. W. Browne, welder, of the Knickerbocker Machine Works, Brooklyn, "for the reason that it is quieter, more easily adjusted, holds the arc better, and is not only faster but, in my opinion, produces much better welds with less effort."

Why not let our nearest welding distributor or office show you the Type WD welder? See it in action. Test it, yourself. You will find that it has everything you want — flexibility, "pep," stability, compactness, easy operation. Remember, you can buy everything you need — welders, electrodes, accessories, cable — on one order blank from one dependable manufacturer. General Electric, Schenectady, New York.

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GENERAL ELECTRIC

The Welding Engineer

VOLUME 18 OCTOBER, 1933 NUMBER 10

The Welding of Corrosion-Resisting Steels...

■ By CHAS. J. JENNINGS
Westinghouse Electric & Mfg. Co.

THE rapid increase in the use of corrosion-resisting steels (chrome and chrome-nickel alloys), together with the development of fusion welding for their fabrication, necessitates that welders, foremen, superintendents and engineers who are connected with welding become familiar with the welding methods and processes employed. It is the purpose of this article, therefore, briefly to summarize and condense some of the available information on the arc-welding of corrosion-resisting steels and to present it in a concise non-technical form.

The characteristics of the various corrosion-resisting alloys are discussed and the proper procedures for arc welding are given.

Classification and Characteristics

From the viewpoint of weldability, most commercial chrome and chrome-nickel alloys can be divided into three general classes:

1. Chrome alloys containing 14% chromium or less (susceptible to air hardening).*
2. Chrome alloys containing over 16% chromium (not appreciably susceptible to air hardening).*
3. Chrome-nickel alloys (austenitic class).

A. Chrome Alloys Containing 14% Chromium or Less:

This class of alloys is susceptible to air hardening. As a result, welds made on them will be hard and brittle. This condition is so severe that cracks may develop in the weld, or in the parent metal adjacent to and parallel to the weld, during the welding process. Partial restoration of ductility and toughness can be obtained by heat-treating at 1200°-1400° F. for 15 to 30 minutes and cooling slowly. Care must be taken not to heat the material over 1450°F.

The low-carbon alloys of this class (carbon below 0.20%) do not require heat treatment to develop their corrosion-resisting properties. The high-carbon alloys of this class (carbon 0.20% or over) are dependent upon heat treatment with rapid cooling and good surface finish for their corrosion-resisting properties. Since the high-carbon alloys require heat treatment and slow cooling to improve their physical properties and heat treatment with rapid cooling to develop their corrosion properties, they are generally unsuited for welding.

B. Chrome Alloys Containing Over 16% Chromium:

Alloys of this class are not appreciably susceptible to air-hardening and have the property of retaining their corrosion resistance at high temperatures. This fact, however, does not result in their being satisfactory to weld. The heat produced by welding causes rapid grain growth, which results in a joint that is hard and brittle at normal temperatures. Heat-treatment will not correct this condition, and as a result alloys of this class are not recommended for welding except in special cases.

At temperatures of 400°-800°F. welded joints in alloys of this class have considerably improved properties. This characteristic, combined with the low expansion properties of these alloys (the expansion properties will be discussed later), makes them suitable for welding when the working temperatures are around 400°-800°F.

C. Chrome-Nickel Alloys (Austenitic Type):

The most universally used alloy of this class is the 18-8 type (18% chromium and 8% nickel). Consequently it is the only one that need be discussed. This material is the most easily welded of all the corrosion-resisting alloys. The welds and parent metal are not subject to air-hardening or grain growth, and the resulting welds are soft, ductile and strong. The physical properties of welds made on this alloy are as follows: ultimate strength, 65,000-75,000 lb. per sq. in.; yield point, 40,000-50,000 lb. per sq. in., and elongation, 15% in 2 in. Heat treatment is not required to improve the physical strength of the welds, although it has a beneficial effect in relieving the welding strains and slightly increasing the ductility and tensile strength.

In alloys where the carbon content is over 0.07%, the heat of welding will cause carbides to precipitate at the grain boundaries and the resistance to corrosion of the weld and surrounding metal is lowered. For carbon contents below 0.07%, no trouble is experienced from this phenomenon. Heat treating at 1800°-2000°F. and quick cooling will put the carbides back into solution and restore the corrosion-resisting properties. (For small and thin pieces air-cooling is sufficiently rapid. For large pieces water quenching is necessary.) The decrease in corrosion-resisting properties resulting from carbide precipitation is not severe, and in many cases heat-treating is not necessary.

*This is an approximate and not a fixed dividing point. Also, the susceptibility to air hardening varies to a certain extent with the carbon content. See T. Holland Nelson on "Riveting and Welding Rustless Structures," Iron Age, Vol. 128, No. 15; also see J. H. G. Monypenny, "Stainless Iron and Steel."

The welding procedure and technique employed in welding the above three classes of corrosion-resisting steels are practically the same, consequently they will be discussed together.

Welding Procedure and Technique

The welding of all the alloys should be done with fluxed electrodes using reverse polarity. (The use of reverse polarity is not a hard and fast rule.) The composition of the electrodes should in general be the same as that of the material being welded. In certain cases, such as where rigid joints in chrome-steel alloys are being welded, it is advisable to use chrome-nickel electrodes because of the superior ductility of the welds obtained.

The electrical resistance of all the chrome and chrome-nickel alloys is relatively high, therefore the electrodes quickly become heated from the current flowing through them. In order to keep the electrodes from over-heating and destroying their flux, it is essential that not more than 7 to 9 in. of electrode be consumed at a time. If 18-in. electrodes are used, it is desirable to grip them in the center and weld from both ends. If it is necessary to grip them at the end, only half the length should be consumed at a time, and the remaining half should be allowed to cool before using.

Chrome-nickel electrodes should not contain more than about 0.07% carbon. Carbonaceous materials are often omitted entirely from the flux because of the general feeling that such materials will break down in the heat of the arc and carburize the weld metal, thereby making it more brittle and less resistant to corrosion.

The thermal conductivity of chrome-nickel alloys is from 30% to 50% of that of mild carbon steel. The thermal conductivity of the chrome alloys is somewhat greater than the above, but they are still considerably below the values of mild carbon steel. This low thermal conductivity retards the transmission of heat from the weld to the surrounding material, consequently special precautions must be taken to prevent over-heating. Several of the most common methods of preventing over-heating are as follows:

Ways to Prevent Overheating

1. The welding currents used should be about 80% of the values used for mild carbon steel electrodes. (This also aids in preventing excessive heating of the electrodes.)

2. The molten metal should not be puddled. Puddling prolongs the length of time the arc is held in a given spot and tends to produce excessive heating.

3. It is often better to deposit several light layers of weld metal instead of one heavy layer. The deposition of a heavy layer produces a heating effect similar to that produced by puddling.

4. Back-up strips of copper will aid in conducting away the heat.

The coefficient of expansion of the chrome alloys of the air-hardening and non-air-hardening class is about 25% less than that of mild carbon steel. As a result, the expansivity of these alloys offers no difficulty from the standpoint of welding.

The coefficient of expansion of chrome-nickel alloys, however, is about 50% greater than that of mild carbon steel. This high coefficient of expansion offers considerable difficulty from the standpoint of welding and must be taken into consideration. Proper fixtures and clamps should be used to prevent warping and distortion.

Preparation of Joints for Welding

The joint preparation for corrosion-resisting steels is similar to that for mild carbon steel. Scarfing is not required on plates ⅛ in. thick or less. Plates 3/16 in. thick or over should be scarfed. When butt welding thin-gage material, the butting edges should be turned up about 1/16 in. to form a so-called double-flanged butt joint.

The welding operation will produce a discolored and corroded area on each side of the weld. This should be removed by pickling or grinding so that it will not start corrosive action.

Both direct-current and alternating-current welders are suitable for welding corrosion-resisting steels. Alternating-current welders equipped with a short-wave arc control are particularly adapted to this class of work because of the stability of the arc obtained.

Curtain Roller and Hangers Made by Welding

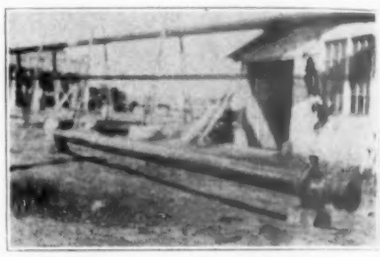
By D. R. GUNDERMAN

Our shop recently fabricated by means of welding a roller for the curtain in the local high-school auditorium, using sheet metal for the roller and two short lengths of pipe for the bearings.

At first we were requested by the clerk of the Board of Education to repair the old roller, which was a combination of 2-in. steel pipe and wood. The roller itself was 8 in. in diameter and had a span of 27 ft. It had developed a sag of about 5 in. in the center, which had created a hazardous condition due to the "throw" on each revolution. Obviously, repair was out of the question, and modern-day practice suggested an all-welded new roller.

We specified 16-gage sheet steel as having sufficient strength and being of the desired lightness in weight. A line was scribed laterally on each sheet and ¼-in. holes drilled 4 in. apart. Over each hole a ¼-in. nut was bronze welded to the sheet, these nuts to come on the inside of the cylinder after rolling. This complicated the rolling process somewhat, but was a necessary feature, as the curtain was to be attached to the roller by passing roundhead stove bolts through the curtain and then screwing them into the nuts permanently welded to the inside of the roller.

After rolling to 8 in. diameter, each section was welded longitudinally, straightened, and rounded upon a mandrel. The lengths comprising the four center sections were correctly lined up and the circumferential welds made. Each of the two end sections was capped at both ends with discs made from 8-gage steel sheet, drilled in the centers to permit entrance of 2-in. steel pipe. The lengths of pipe were then run through each end section and welded to the discs



Curtain Roller Made From Sheet Steel.

capping each end, enough pipe protruding from the outer ends to form the bearings.

Both of these end sections were then joined by means of circumferential welds to the four-length section already made up, thus completing the cylinder.

With the bearings supported in V-blocks, a load of 150 lb. applied in the center of the cylinder caused no appreciable deflection, indicating that there would be no "throw." After the roller was erected and put in use, no deflection or "throw" was evident, indicating accuracy in alignment and strength of welded construction.

All-welded steel ceiling hangers, each housing anti-friction bearings, were made up from which to hang the curtain roller. The ease of operation made the curtain self-lowering. An ingenious device made from a discarded automobile brake drum, on which a flywheel starting-gear rim was welded with a ratchet pawl connected to the brake band, made it possible for the student stage hand to lower the curtain and stop it permanently at any desired height without the use of a "snubbing post."

This job was constructed at a very reasonable cost compared with the cost of a patented installation. The finished job has received much favorable comment as to neatness in appearance and ease of operation.

Welded Electrolytic Copper Develops 100% Strength

Practically full strength of hot-rolled electrolytic copper has been developed by welding with the "Long-Arc" method, using the carbon arc, as described in the article by Mr. Chaffee on pages 20-23 in the September issue of *The Welding Engineer*. Specimens were welded at the plant of the Hobart Bros. Co. in Troy, Ohio, and these were tested by The American Brass Co.

Copper plates containing 0.05% oxygen, and ⅛ in. thick, were used. Of the six specimens, three were tested with the weld reinforcement on and three with the weld ground flush with the surface of the specimen plates. All specimens were tested to destruction, and the specimens were shaped to cause fracture to occur in the weld.

The three specimens with the reinforcement left on tested 32,400, 32,300 and 29,100 lb. per sq. in., respectively. The specimens with the reinforcements ground off showed strengths of 33,200, 29,100 and 33,400 lb. per sq. in., respectively. All six specimens were on display in the American Brass Co. booth at the brewery exposition in Chicago the week of September 24th and in their booth at the National Metal Exposition in Detroit the following week.

Making Machinable Welds in Cast Iron

Welds made with monel-metal electrodes on gray cast iron are easily machined and are highly resistant to mechanical influences and to oxidation, states an article appearing in *Revue du Nickel*, vol. 4, pp. 92-94, 1933. An examination of the weld under the microscope reveals no cementite as is found in the hard zone of a cast-iron weld made with soft cast-iron or soft steel electrodes. White spots are found in monel welds on cast iron, but these consist of steadite (phospho-carbide of iron).

The absence of iron carbides, which seems to account for the machinability of monel-made welds, is probably due largely to the high percentage of nickel (68%) contained in monel metal. Nickel decomposes cementite into ferrite and graphite. The thin layer of cast iron brought to fusion probably absorbs a sufficient quantity of nickel to prevent the deposition of iron carbides.

On cold gray-iron castings, the monel metal must be applied by means of short (less than 2 in.) beads which should be as thin as possible. Each bead should be hammered lightly to reduce strains resulting from cooling and to increase the density of the metal in the event the casting is to withstand pressure. Each of these short elements should be allowed to cool completely before the operation is resumed. To avoid loss of time, skip welding should be used or beads laid alternately on two or more castings at the same time.

Arc welding should preferably be done horizontally, though very experienced welders can execute reliable vertical welds. For electrodes 4 mm. in diameter, a current of 175 amperes is recommended, with a rather short arc. Monel-metal electrodes can be used with automatic machines.

For gas welding, the pieces should be preheated and a borax slag used to cover the weld during the welding operation.

Acetylene Association Elects Officers

At the election held by the International Acetylene Association in Chicago on September 29th, H. B. Pearson, president of Compressed Industrial Gases, Chicago, was elected president, and

H. B. Pearson, President of I. A. A.

Philip Kearney, president of the K-G Welding & Cutting Co., New York, was elected vice-president.

The new president, Mr. Pearson, has been connected with the oxygen and acetylene industry since its early days. He helped to organize the Searchlight Co., of Chicago, which engaged in the manufacture of acetylene, and in 1917 he joined the Burdette Oxygen Co. Upon the organizing of Compressed Industrial Gases in 1928, of which six Burdette Oxygen Companies are wholly owned subsidiaries, he became president of the firm.

Welded Fireplace Fixtures Resemble Hammered Iron

An artistic fireplace stand, andirons, and a stand from which are hung a pair of tongs, shovel, and poker, were on display in the booth of The Bastian-Blessing Co. at the National Metal Exposition in Detroit, October 2nd to 6th. These pieces, of all-welded construction, were made by the Boland Welding Shop, West Unity, Ohio. Steel plate was used largely in their construction, making a hollow, or box, design of light weight, yet strong and rigid. Before welding the plates were well peened, so the finished effect resembled that of hammered iron. The general effect of the display was so pleasing to the eye that it was apparent that the designer had a highly developed sense of proportion and balance.

J. A. Nieuwland Receives Morehead Medal Award

The Morehead Medal, awarded annually by the International Acetylene Association, was presented this year to the Reverend Julius Arthur Nieuwland, professor of organic chemistry at the University of Notre Dame, South Bend, Ind. As early as 1904, only nine years after the discovery of the commercial process for manufacturing calcium carbide, Father Nieuwland published an exhaustive treatise covering his research and studies, entitled "Some Reactions of Acetylene," which remains to this day an authoritative reference work. In the intervening years he has continued his fundamental research in the chemistry of acetylene. His contributions to the practical use of acetylene in synthetic organic chemistry have been of vast scientific and commercial importance.

Monthly Journal Devoted to Electric Welding

A new monthly publication *Electric Welding* makes its appearance beginning with the October number and will take the place of *Industry and Welding*, according to an announcement from Irving B. Hexter, Cleveland publisher. The new magazine will be devoted to electric welding in all its phases as well as torch cutting and silver soldering. Harold S. Card, a well known figure in the welding field, who for many years was editor of *The Welding Engineer* and *The Welding Encyclopedia* and is the author of "The Welding Industry," becomes editor of the new publication.

New California Refinery Will Entail Much Welding

A large amount of welding will be under way in the near future in San Diego, Calif., according to plans announced by the La Canada Co., Ltd., which company will construct the first oil refinery and gasoline plant in that city. The plant will be equipped to include both skimming and cracking facilities, the manufacture and installation of which will require a great deal of both oxyacetylene and electric welding. Contracts have already been awarded, and work will start immediately. Completion of the plant is scheduled for January 1, 1934. B. C. Morrison is president of the company which will build and operate the new refinery.

Museum Exploits Art of Welding and Cutting by means of permanent demonstrations

INSTRUCTIVE demonstrations of welding and cutting are a part of the permanent display in the Museum of Science and Industry, located in Jackson Park, Chicago, and opened for the first time to the public last July 1st. Welding was also used in the construction of the head frame over the coal-mine shaft in the Museum as well as in the building of various machines on display. The exhibit also includes an X-ray machine for industrial applications.

The huge structure in which the Museum is housed dates back to the days of the World's Columbian Exposition. It was then the Fine Arts Building—the finest example of classic architecture at the Exposition and acclaimed by many as second only to the Parthenon at Athens.

Moving Exhibits Teach of Man's Technical Progress

A few years ago the building was rebuilt as a permanent structure, incorporating all the details in design that the old building had. About this time, Julius Rosenwald, head of Sears Roebuck & Co., left a fund for the establishment of a permanent museum to be patterned somewhat along the lines of the one in Munich, Germany, and to reveal the technical progress of man. The aim is to have exhibits that are dynamic rather than static in character, many of them so arranged that the visitor can operate them himself. Although occupying only one section of the building at present, ultimately the exhibits will be extended to fill the entire structure, including an upper or gallery floor that is being built in. All exhibits are planned under the guidance of Dr. O. T. Kreusser, director of the Museum.

The focal-point of the Museum is a life-size coal mine built under the dome of the building. Here the visitor leaves the main floor of the building, walks up a flight of stairs to the top of a welded head frame, enters a cage and is transported about 500 ft. underground (so it seems to him, for the illusion is perfect). A narrow-gage train takes him through the underground workings, and to all intents and purposes he has visited a real coal mine.

All-Welded Head Frame Built Over Mine Shaft.

The all-welded head frame of this mine measures 61 ft. 6 in. from the floor line to the center of the upper sheave, and the maximum horizontal dimension is 38 ft. 4 in. This head is a 3-legged tower with a single bent placed at the side to support the bin. The sheaves are set one over the other and the hoist is located at the end of the shaft compartments. The main member carrying the sheave load is made up of split I-beams laced with angles spaced about 4 ft. apart. Channels and C-beams are employed in the construction of the columns.

Spectacular Demonstration of Under-Water Cutting

The welding and cutting demonstrations, according to the attendants in charge, are attracting greater crowds than any of the other exhibits, and of these the under-water cutting demonstration is outstanding in point of interest shown by the Museum visitors. This exhibit represents perhaps the only time that under-water cutting has been displayed to the general public, although a semi-public exhibit of this nature was given in Madison, Wis., a few years ago, in which the cutting was done in an indoor swimming pool.

The demonstrator wears a diver's suit, as can be seen by reference to the illustration on the cover of this issue, and every move and operation he makes is open to the scrutiny of his audience, who view the operation through a glass window located in the side of the tank. The diver is provided with a microphone connected to a public-address system so the audience can hear him explain the operation at the same time he is demonstrating it. He works under several feet of water, and the equipment and apparatus are the same as used in actual deep-sea salvaging operations.

The diver uses a flat carbon electrode

provided with two holes which connect with a supply of tank oxygen and deliver the oxygen to the end of the electrode. The electrode is attached to one terminal of an arc-welding machine, and an arc is formed by striking the end of the electrode against the work to be cut. This brings the metal at this point to a red heat, and the oxygen then combines with the heated steel just as in the case

Watching an Arc-Welding Demonstration.

of the ordinary cutting torch, and only a very brief time is required to sever the end off a steel bar.

Arc welding also comes in for its share of attention. The metallic-arc welding of metals is being demonstrated in a booth made of stainless steel with

Operating the Spot Welder.

all joints welded. Here also the process is explained by the operator as he is welding, by means of a public-address system. On three sides of the booth are provided windows with cover glass through which the visitors can watch the operation. Many examples of electrodes and weld test specimens are on display.

A spot-welding machine is also on demonstration. Here two thin metal strips can be spot-welded together and retained by the visitor as a memento of the Museum, each strip being embossed with the name of the Museum as it comes from a dieing machine located alongside the spot welder.

An X-ray machine of the portable type, used for making radiographs of welds, castings, etc., is also on display. An examination of coal tables, pulverizers, etc., on display shows many places where welding has been used as a construction tool.

The demonstrations on welding and cutting are given frequently during each day. General admission is without charge, and the Museum is open every day, including Sundays, from 10 a.m. to 6 p.m. Already the admission records show a total of almost 300,000 visitors.

Los Angeles A. W. S. Group See Huge Syphon Job

The Los Angeles Section of the American Welding Society started the fall season with a dinner at Cole's cafeteria, in Huntington Park, on the evening of October 19th, followed by a visit to the plant of the Western Pipe & Steel Co., 5717 Santa Fe Ave., where interest was shown in the fabricating of the syphon for the Los Angeles Department of Water & Power Bouquet Canyon job. Plates up to 1-1/16 in. in thickness are used, these being formed to shape and welded. P. L. Sterkle, general superintendent of the plant, outlined the work in progress.

Contracts Awarded for Arc-Welded Pipelines

Construction of a 10-in. arc-welded pipeline approximately 215 miles in length is now under way in Arizona, according to an announcement by the Western Gas Co., of El Paso, Texas, which company purposes the extension of its pipeline system into Southern Arizona. The route of the line will be from a point near Douglas, Ariz., to Tucson and Phoenix.

The contract for the construction of this line has been awarded to the Bechtel-Kaiser Co., of San Francisco, Calif. Employment will be given to about 1500 men, including a large crew of welders. About five months will be required to complete this line, which will convey natural gas to the cities of Tucson and Phoenix, where at present artificial gas is being used.

The electric welding is being done under contract by H. C. Price, Inc., of Bartlesville, Okla.

H. C. Price, Inc., are also welding contractors on 48 miles of 18-in. arc-welded pipeline for the Minnesota Northern Natural Gas Co., from Owatonna, Minn., to St. Paul, which is now being laid. The Fredell Construction Co., of Denver, are the general contractors.

Artistic Andirons Made Out of Scrap

In his spare time, George M. Bulgin, of Franklin, N. Car., assembled some scrap pieces by welding to form the andirons shown in the illustration.

Mr. Bulgin's place is just the usual blacksmith and welding shop that is frequently seen in small communities. He is called upon to make and repair articles from the size of a locomotive to a spectacle rim. As a result, this village blacksmith has acquired considerable ingenuity and artistic sense, and is depended upon by the mountain folk for a great

Andirons Made From Automobile Front Axles and Rings.

many miles around this North Carolina community to make and fix things for them.

In the scrap that accumulates around such a shop as his, Mr. Bulgin found some automobile front axles. He cut the axles into the proper lengths with his cutting torch and then split a piece in half part way up to form the front legs of the andiron. Another part of the axle was used for the back support and leg, and upon close scrutiny of the picture one can see where the hole for the spindle was filled up with the aid of the torch. The back part of the andiron was securely welded with the oxyacetylene torch to the front upright piece, and the ornamental rings at the top were added in the same way. This makes a very handsome decoration to one's fireplace—one that is rugged as well as useful.

The principal expense in connection with the manufacture of these andirons was a small amount of oxygen, acetylene and filler rods, and yet many summer visitors to this mountain spot pay handsome prices for these fixtures.

Arc-Welded Floodlight Towers

■ By J. PAUL H. HIVELY
Electrical Contractor

COMPETITION in modern industry necessitates the adoption of any process which will increase the quality and quantity of its products at favorable costs. Present-day knowledge of arc-welding furnishes every reason for welding floodlight towers on such a basis.

The demand for floodlight towers is supplied by numerous manufacturers. The author has noted that in 150 installations, some requiring 8 towers each, none was welded. Much time might have been saved by welding these towers from materials supplied by local firms.

Factory-built towers usually have riveted base plates, while the remaining structure is assembled by bolts in the field.

Figures 1 and 2 illustrate typical riveted base plates. Welded base plates for equivalent towers are shown in Figures 3 and 4. The simplicity and advantages of such fabrication are obviously in favor of welding.

In the design of welded structures, gross section equals net section, consequently welded towers can employ smaller sections than bolted towers.

Smaller Gross Sections Used in Welded Towers

The bolted tower requires 3 bolt holes where any two diagonals are connected to the leg angles in one vertical plane, and splices in the leg angles require as many as 18 holes in a joint. Gross sections on bolted towers are consequently larger than on welded towers.

Theoretically and practically, the best tower construction is obtained when each leg member is supported at one point by diagonals in vertical planes at 90° as shown in Figure 5.

However, with bolted construction, 6 holes would be required at each point, demanding an increase in gross section to maintain the allowable slenderness ratio. The only economical step is to stagger the diagonals on the leg angles, and use redundants spaced approximately the distance of one free length of section. The addition of redundants, and the increase in gross section for bolt holes, add to the weight of bolted structures.

On welded towers, each free length of section is tied in two vertical planes 100% of tower height, whereas a bolted tower has an average of 60% to 70% of tower height.

Splice Joints for Leg Angles

Two types of joints are used for splicing leg angles—double-strapped and edge joints.

On the light-duty 50-ft. tower, the leg angles are butted together. A section of the same angle used for the legs is edge welded in place.

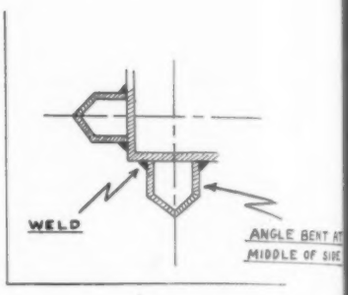
There is one splice in each leg, and no two splices are made in the same horizontal plane. All splices are spaced so they are in different planes by at least the distance of one free length of section. This construction avoids the use of redundants which would be necessary if all the splices were made in one horizontal plane. Angles, 2x2x¼ in. in size, are used for the entire height of the tower leg.

The heavy-duty towers are designed in three sections. Splices are required in all four leg angles in the same horizontal plane, as shown in Figure 6. The sections of leg angles for a 70-ft. tower vary as follows: 6x6x⅜-in. for the first 20-ft. section, 5x5x⅜-in. for the second 20-ft. section, and 4x4x⅜-in. for the remaining section.

These splices are made by butting the leg angles together and using the double-strapped joint with fillet welds. Care must be used not to weld over the joints of the leg angles.

Redundants and tie bracing are used at each splice in the lower section. This gives the rigid effect of a foundation. The

Fig. 3. View of Welded Base Plate for Light-Duty Tower.



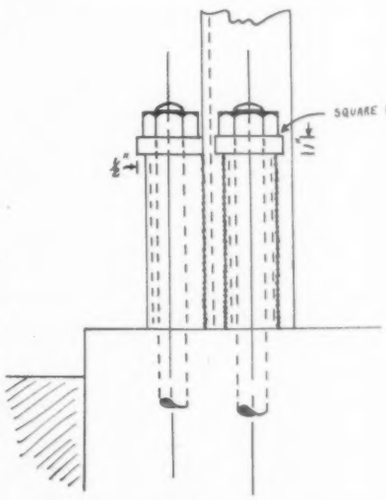
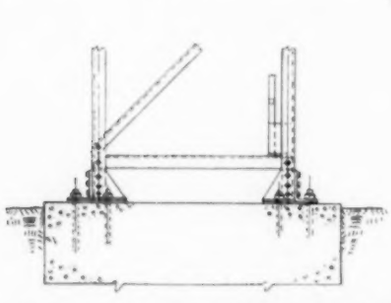
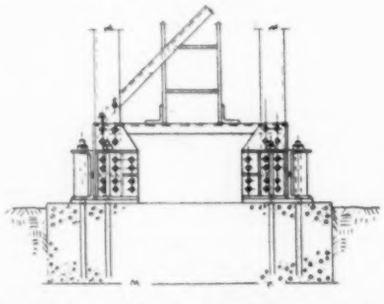


Fig. 4. Details of Welded Base Plate for Heavy-Duty Tower.





Figs. 1 and 2. Typical Riveted Base Plates for Light and Heavy Duty Respectively.

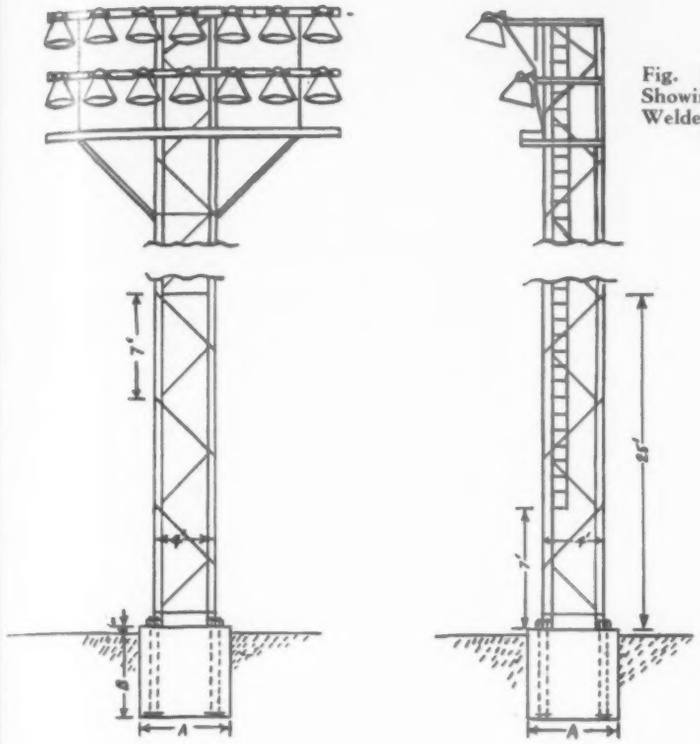


Fig. 5. Drawing Showing Design of Welded Floodlight Tower.

section above, which is secured by the double-strapped joints, is given freedom for wind sway necessary in tall structures. For this reason, welding is not continued over the joints of the leg angles. These two flexible joints give the tower ample rigidity with enough flexibility to provide wind sway and avoid excessive strain on any members.

Layout of Work for Shop Welding

Three towers are entirely shop welded except for mounting supports for lights, which are bolted in place after erection. The leg angles are placed on the shop floor, spaced and held in place by tie clamps. Two hand operators proceed to weld the diagonals in place opposite each other, taking up all strains as they are produced, which eliminates warping of leg angles.

With two sections thus completed, they are placed in a vertical position and clamps applied to retain them. The diagonals are then welded between these two sections the full length of the tower, completing the lacing on all three sides. The tower is then placed with the uncompleted side to the floor and welded in like manner.

Ends of the leg angles are cut and base plates attached. The structure is then given one coat of shop paint.

The towers are transported on trailer trucks to the erection site and placed midway across the foundation. A 10-ton derrick truck, to which a 70-ft. gin pole is attached, facilitates easy erection. The truck is backed up to the foundation site and a grab is taken at 60% of the tower height to insure easy handling of the base. The structure is bolted to the foundation in a short period of time.

The truck proves to be a real asset on this type of job, since, with a gin pole attached, it is driven to each foundation, ready to raise the tower. With such an arrangement, requiring 6 men, towers are erected at the rate of one every 1½ hours.

It is obvious that a welded structure has every advantage over a bolted structure, which is erected piece by piece in the air, not to mention the time consumed in handling, raising and sorting of members.

Comparative Costs Based on Height of Tower

The following table shows costs, which are very favorable to are welding when given on the basis of height comparison, although the cost per pound of structure remains nearly equal to that of bolted construction:

	Height, Ft.	Weight, Lb.	Total Cost	Cost per Pound	Cost per Foot
Riveted	50	1900	$105	$0.0553	$2.10
	70	5900	360	0.0610	5.15
Welded	50	1500	75	0.0500	1.50
	70	5000	300	0.0600	4.30

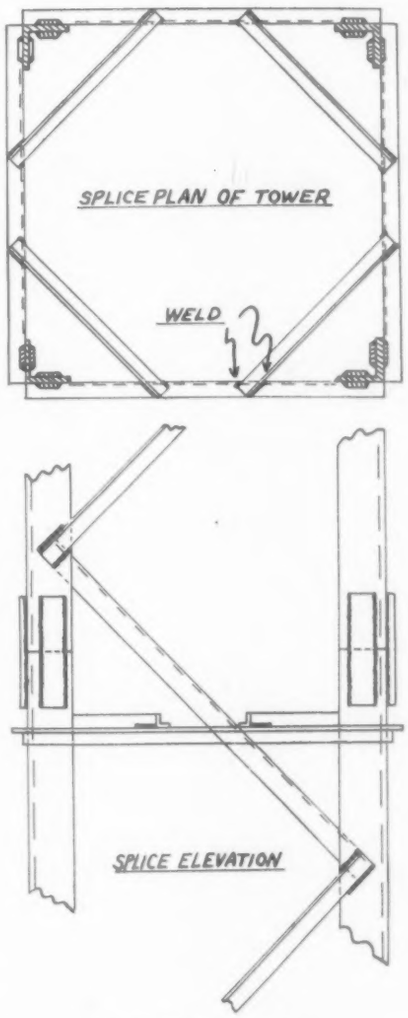


Fig. 6. Design of Splices.

Cleveland A. S. S. T. to Hear Lectures on Welding

An educational course of six lectures on "Weld Design and Production" will be given by Robert E. Kinkead, consulting engineer of Cleveland, Ohio, before the Cleveland Chapter of the American Society for Steel Treating, beginning Monday, Oct. 23rd, at 8 p.m., and continuing for five Mondays thereafter, excepting Nov. 13th. The course, which is open to members of the Cleveland Chapter without charge, will treat of welding methods, effect of welding heat on metals, relieving residual strains, joint design, testing and inspection, factor of safety, and the position of welding in manufacturing and maintenance. All the lectures will be given in the auditorium of the Bingham Mechanical Building, Case School of Applied Science.

A.S.S.T. Proposes Change in Name

A new name has been proposed for the American Society for Steel Treating. A recent unanimous resolution of the Society's board of directors recommends that the Society be known as the American Metals Society, which would be more in harmony with its purposes and more representative of its scope of activities. The new name must be submitted by referendum to the membership, the proposal taking the form of an amendment to the constitution of the Society. Approval of the proposal means that the new name will come into official use about Jan. 1st.

Purdue Conference to Be Held December 7-8

The Ninth Annual Welders' Conference at Purdue University, Lafayette, Ind., will be held on Thursday and Friday, December 7th and 8th, says an announcement from J. D. Hoffman, director of the Department of Practical Mechanics. The program will be announced at a later date.

Quick Repair on Huge Rack Made by Thermit Welding

Recently in an eastern steel mill the rack of a large ball press, the largest of its kind, failed. Fracture occurred adjacent to a flange at one end of the rack. This presented a difficult job for thermit welding because of the hollow box section of the rack, yet the repair was made speedily and at a small fraction of the cost of a new rack.

Close-Up View of Thermit Repair.

Six hundred pounds of forging thermit was used, and the entire repair, made by the steel company's own men under the supervision of the Metal & Thermit Corp. representatives, required only a few days' time, including the removal of the rack from the press, lining it up on a bed-plate, constructing the molds, preheating, and actually making the weld. The repaired rack is shown in the two illustrations.

Rack With End Repair Made by Thermit Welding.

The recent spurt in steel production has caused machines and equipment which had lain idle for two years to be pushed to capacity, with the result that some failures were bound to occur. Thermit welding has been an economical solution to many repair jobs in the steel mills. Since the physical characteristics of thermit-deposited metal are equal to those of the parent metal, such repairs are considered as permanent.

Extolls Gas Welding by Means of Drama

How welding was used to rehabilitate an industrial plant in the nick of time so that orders obtained by an aggressive sales department could be met on the delivery date specified, was told vividly in a play entitled "The Prosperity Process," given in the Goodman Theater, Chicago, on the nights of September 27th and 28th, by the International Acetylene Association. The play was also repeated at the Masonic Temple, Detroit, the evening of October 3rd.

The play, together with a motion picture which formed a part of the drama, extolled at considerable length the values of gas cutting and welding. A sprinkling of wit and surprising episodes throughout the four acts held the interest of the audience, a great many of whom were not interested in the technical phases of the welding processes.

All the actors were employes of welding equipment manufacturers, some of them being prominent figures in the welding field. Particular mention should be made of T. M. Hamer, who played the part of John Borden, president of the Central Manufacturing Co., and John J. Crowe, who took the part of Otis Dodge, works manager of the company, both of whom had very difficult roles. In business life, both Mr. Hamer and Mr. Crowe are connected with the Air Reduction Sales Co.

Then there was E. C. Turner, who took the part of Jasper Bull (one of four welders) who almost had the works manager sold on the idea that he could weld anything, but when the time came to make the qualification tests he was out somewhere in the shop looking for the NRA sign. Miss Betty Renner, the president's secretary, and all the others played their parts admirably.

John P. Waters, of The Linde Air Products Co., was author of the play, which is a credit to his ability as a playwright.

Punch-Press Frame Repaired by Welding

A 390-ton press in a manufacturing establishment in Joliet, Ill., was temporarily put out of commission by the fracturing of the steel frame. The addition of welded reinforcing plates over the lines of fracture resulted in a quick and inexpensive repair. The illustration shows one of the fractured plates after being repaired.

Frame Repaired With Welded Plates.

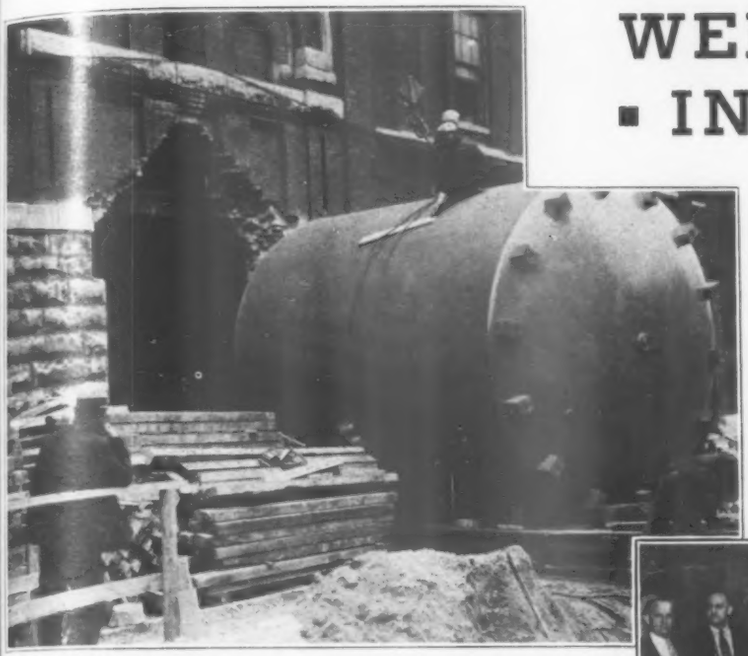
The frame at each end of the press represents a box section formed of rolled plate. The plate which fractured was 2 in. thick and 38 in. wide. One side of the frame was broken practically all the way across and the other side was broken for a length of 10 in. Both sides were reinforced by a 1-in.-thick steel plate 10 in. wide, welded solidly to the frame.

The total time consumed for the repair was 45½ hours for two welders, and 55 lb. of No. 6 Wilson welding wire was used. The repair was made by the Anchor Welding Service, 4715 W. Chicago Ave., Chicago, Ill.

California High Schools Teach Welding

Much interest is being shown in welding by high school students in southern California territory. An evening class has been organized at the Manual Arts High School at 42nd St. and Vermont Ave., in Los Angeles with 38 students enrolled. The class is under the supervision of M. F. Conway, instructor, who was formerly associated with the Douglas Aircraft Co. Another school reporting a large class recently organized is the Alhambra High School, in Alhambra, with a total of 40 students, including both elementary and advanced students. C. Rawson is instructor.

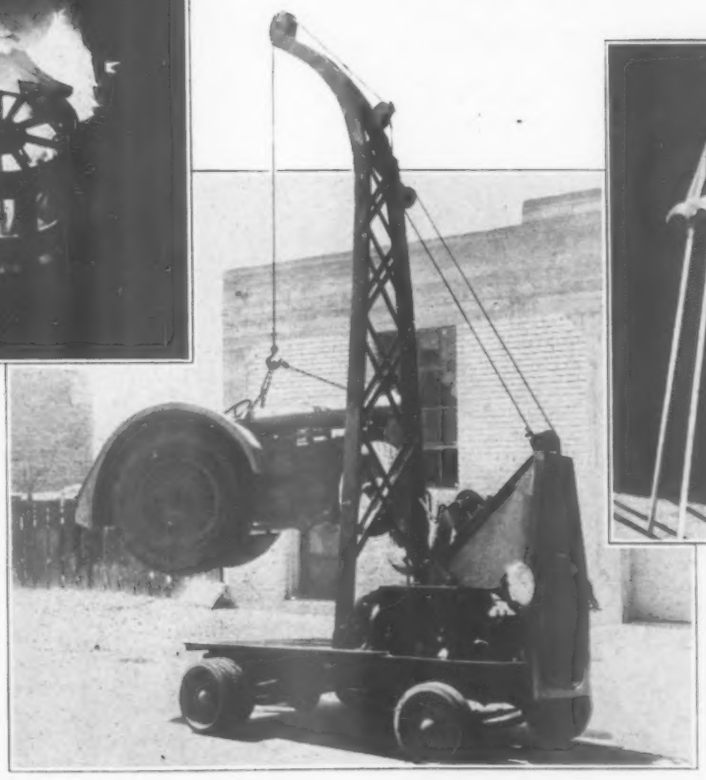
WELDING NEWS
▪ IN PICTURES ▪



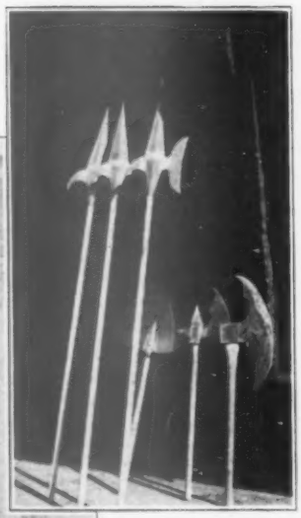
In she goes! Through holes in the wall, 107 welded steel storage tanks are being installed in record time in the Blatz warehouse.

A sign of the "new deal." A group of welding shop owners in Cincinnati—one of the first such organizations.

A flash of flame—a hiss—and a few odd-shaped steel parts become a one-piece motor frame. (Courtesy The Lincoln Electric Co.)



Light, sturdy crane of welded design, made by "HH" Manufacturers, Inc., Long Beach, Calif.



Battleaxes and spears of hollow construction, made by torch-cutting shapes from plates and welding along edges. Made by Austin Welding Works, Chicago, for the Belgian Village at a Century of Progress.

Highest Welded Structure in Europe

By A. C. BLACKALL

A new attraction has just been added to the permanent sights of Milan, Signor Crollalanza, Minister of Public Works, having officially opened the Littoria Tower in the park alongside the Fifth International Exposition of Decorative Art.

The tower is of welded light steel tubing, painted aluminum, and is 356 ft. high—30 in. below the crown of the statue of the Madonna which surmounts Milan Cathedral. Signor Mussolini himself requested that this difference should exist, remarking that "the profane should not surpass the sacred." An elevator takes the visitor to the top in 35 seconds. Here there is a belvedere which affords a magnificent view of the city and of the Lombard Plain as far as the Alps. Surmounting all is a lantern, the light from which will be visible at night for 20 miles.

The new tower is claimed to be the highest welded structure in Europe.

Engine-Frame Repair Saves $2400

By W. E. ARCHER

When a welding job saves a company upward of $2,400, it is worthy of mention. Just such a job was recently completed by an old company in California and is shown in the illustration. This repair job is on the base of the frame of a 165-hp. engine. A break occurred at a corner of the frame, where the casting is about 2¾ in. thick, and extended both ways for a distance of about 40 in. The repair was made by arc welding.

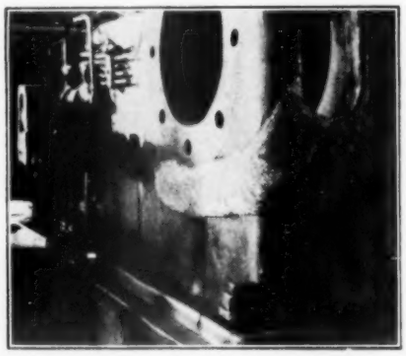
The broken section was prepared for welding by veeing out the outside of the crack to a depth of about 1½ in., using an air hammer. Holes were then drilled on each side of the crack and two rows of ⅝-in. steel studs were inserted staggerfashion along the entire length of the break. These studs were about 1½ in. long and were set in far enough to extend or veeing was done. A total of 190 studs out of the casting about ⅜ in. Studs in like manner were then placed on each side of the break on the reverse side of the casting, but on that side no beveling were used.

Actual welding operations were then started on the outside, or veed side, of the casting. A current of approximately 200 amperes at 50 volts was used, supplied from a portable Westinghouse generator, and all welding was done with 5/32-in. Roebling rods.

The metal first was applied at one end of the break, working back and forth across the crack and around the studs. As the area became heated too much for safety, the welder would shift to the opposite end of the break, and thus allow the heated area to cool. At no time, it is said, was the casting allowed to get so hot that one could not hold his hand on it. This procedure was followed until the job was completed. Five layers of weld metal were required to round out and complete the weld, which, when finished, was about 5 in. wide and about 1½ in. thick in the middle.

The inside of the casting, not being veed out, was welded much in the usual manner for such work, the weld metal being built up well around the studs.

The repaired engine comprised a unit of a large compressor plant in the Signal Hill oil field near Long Beach, Calif. The cost of a new frame for the engine would have been about $2,500, it was pointed



Repair Made by Studding and Welding.

out by the engineers, whereas the entire cost of welding the broken frame was slightly less than $75, making a net saving to the company of more than $2,400. One welder aand helper did the entire job in four 8-hour days.

Phos-Copper Repair on Church Bell

A 300-lb. church bell, with a crack encircling the top, was recently made good as new by welding it with Westinghouse Phos-Copper rod.

To find the best rod for the job the break was first chipped to a regulation vee for welding. Chips from the bell were then welded to different rods. The welded fragments were sawn in two and given a bend test. Phos-Copper apparently gave the best results, in addition to melting at about the same temperature as the melting point of the bell metal. Under the torch this alloy acted more like the parent metal than any other rod tried.

On the job the bell was slowly preheated with charcoal. In welding, the Phos-Copper rod and bell metal were actually fused together, although not deeply puddled. Three pounds of Phos-Copper rod were used for the operation. After welding, the bell was allowed to cool slowly. Airco gases and apparatus were employed. The finished weld was barely visible.

Bridge to Have Welded Wrought-Iron Railings

In the design of the proposed Euclid Avenue bridge in Des Moines, Iowa, plans call for a concrete structure with wrought-iron railings, and considerable welding is specified in the fabrication of the railings. This bridge, which will be 600 ft. long, is being designed by the Marsh Engineering Co., of Des Moines.

Originally it was intended to employ concrete railings, but John Quinn, district bridge engineer for the Federal Road Bureau, Omaha, Nebr., objected to them on the grounds that they obstruct the vision, and he suggested a metal type of railing. E. W. Blumenshein, engineer of bridges, Iowa State Highway Commission, influenced the decision to use wrought iron by calling attention to the corrosion-resisting characteristics of this material.

Completes Contract for Brewery Tanks

The Berghoff Products Company, Ft. Wayne, Ind., have completed the construction of five 27,000-gallon tanks and seventeen 3,000-gallon tanks. The larger tanks are of the horizontal type and the small ones of the vertical type, all made of ⅜-in. plate.

The construction of the 3,000-gallon tanks presented a problem that only a jig-saw-puzzle fan could solve. These tanks were to be installed on an upper floor and they had to be hauled up in sections, as rolled, by block and tackle from outside the building and installed in a room approximately 61x61 ft. in size. The knocked-down tank consisted of upper and lower flanged and dished heads, and the sides were in two parts, each rolled to a half circle, making a total of four parts to each tank, and as there were seventeen of these tanks, the number of parts totaled 68. It was necessary to make a hole in the side of the building through which to pass these parts. In addition to the limited capacity of the room in which these tanks were installed, there were six pillars to hamper the workmen.

A crew would assemble the side pieces and an oxyacetylene welder would weld them. Next, the top head was laid on and pulled into place by a very ingenious device developed by the F. S. Bowser Co. The head was then tacked in place, after which the bottom was placed into position in a similar manner. The tank was then wheeled to its proper location and welders would start to weld from both inside and out. After welding, the inside welds were cleaned off flush, as the tanks had to have an inside liner of glass composition. These tanks will be used in the manufacture of beer.

Course of Instruction in Welding Engineering

A course in welding engineering open only to experienced welders, managers, superintendents, foremen, salesmen and welding engineers is being given by the Dunwoody Industrial Institute, 818 Wayzata Blvd., Minneapolis, Minn. The instructor is Stuart Plumley, for many years a well-known figure in the welding field. The first class session was on September 26th, and the class meets every Tuesday and Friday evening for 50 nights. The cost of the entire course is $6.00.

Instruction is given in the technical phases of welding only, including scientific trouble-shooting, selection of rods for the particular job, costs, economies in materials, modern methods and appliances, engineering practice and design, strength of welds, metallography, codes and other regulations, cutting iron and steel, etc.

The Dunwoody Institute is also offering its regular day and night welding classes for beginners.

Drafting-Room Code for Structural Welding

Prior to the adoption of a code of standards for drafting-room practice in structural welding, The Detroit Edison Co. found that some welds were being made oversize and some undersize, due to the fact that the drafting room merely made notations that certain pieces were to be welded, leaving all responsibility for weld size to the welder who is untrained in the theory of stresses. This code was adopted on December 17, 1930, under the name of "Instruction for Drafting Room on Structural Welding" and was revised on January 12, 1933, to bring it up to date. This code puts the responsibility on the drafting room instead of on the welding operator and it also provides a record of the amount and size of welds on each job, in case of future changes. The revised code is as follows:

The size, length, type and location of all welding shall be noted on the detail drawings, using the symbols given below. Fillet welding as per the sketch below must be used whenever possible. Butt or slot welds may be used only under special circumstances.

A. Indicate the size of the fillet in sixteenths as follows:

No. 2	(2/16) for ⅛-in. fillets or under
No. 3	(3/16) for 3/16-in. fillets
No. 4	(4/16) for ¼-in. fillets
No. 5	(5/16) for 5/16-in. fillets
No. 6	(6/16) for ⅜-in. fillets
No. 8	(8/16) for ½-in. fillets
No. 12	(12/16) for ¾-in. fillets

B. Indicate the type of fillet thus:
"C" for continuous fillet.
"T" for intermittently spaced fillets.
"F" for field welding.
"A" for staggered spacing.

C. Note Welding on drawings as follows:
The number indicating the size of the fillet (see section A above) will be followed by the letter indicating the type ("C" or "T") and this in turn by the length of the fillet in inches. The spacing of intermittent fillets will be given in inches after the length, separating the two numbers by a dash. Staggered intermittent spacing will be indicated by the letter "A" following the spacing. Field welding will be indicated by preceding the entire notation by the letter "F." Welding not so noted will be done at the shop.

D. Examples:
1. Continuous shop welding of a column to its base plate: (for a ⅜-in. fillet, continuous weld on both sides of web and both sides of each flange) "6C."
2. Intermittent shop welding of a plate to the bottom of a beam: (for a 5/16-in. fillet, 2 in. long, 9 in. on centers) "5T2—9."
3. Field welding of a sash angle to the bottom of a beam: "Heel F4C, Toe F3T2—12."
4. Cover plates to a beam: (continuous weld at each end, balance intermittently spaced, staggered fillets) "Each Plate 6C24 both sides at each end, balance 6T2—8A."

E. General Notes on Welding:
The general instruction "weld," leaving the shop or field to their own interpretation, must NOT be used.
The notation will usually indicate sufficiently what welding is required and where; but where a specific location of a weld is necessary, indicate its position by a heavy line or dot. In general, use cross-sectional views for this purpose. Supplementary instructions should be given whenever required.
Continuous fillets may be of any length, but fillets for intermittent spacing will have a standard length of 2 in. with a maximum of 4 in. The minimum length of any strength weld shall be 4 times the size of the fillet. The welder will add ½ in. to whatever length is called for to allow for craters. Use continuous welding where the space between intermittent fillets becomes less than 2 in.
In general, do not use less than No. 4 for strength weld.

F. Unit Stresses:
The permissible welding stresses for triangular fillet welds in either longitudinal or transverse shear (that is, the weld being placed in the direction of, or transversely to, the line of stress) shall be as follows:

Size of Fillet	Permissible Stress lb. per sq. in.
No. 3	1500
No. 4	2000
No. 5	2500
No. 6	3000
No. 8	4000*
No. 12	6000*

*Two or more beads but not less than two.

Book Reviews

PROCEDURE HANDBOOK OF ARC-WELDING DESIGN AND PRACTICE. 5¾x9 in.; 434 pages; 500 illustrations and drawings. Flexible binding; price, $1.50 postpaid. Published by The Lincoln Electric Co., Cleveland, Ohio.

This is a comprehensive work on the design and procedure involved in the economic application of arc welding. The text is clear and concise, and the many photographs and diagrams are apropos. Valuable data are given on procedure, speeds and welding costs.

The eight sections into which the book is divided treat, respectively, of welding methods and equipment, technique; procedure, speeds and costs; structures and properties of weld metal, weldability of metals, designing for arc-welded steel construction of machinery, design for arc-welded fabrication of steel structures, and applications of arc welding in manufacturing construction and maintenance.

The data contained herein will appeal alike to the designer and maintenance man, while departmental heads as well as welders will also find a great deal of value between the covers of this book.

VOCATIONAL GUIDANCE IN ENGINEERING LINES. Elicited and edited by the American Association of Engineers. 6x9 in.; 521 pages; 50 illustrations. Cloth binding. Price, $2.50; 10 or more, $2.00 each. Published by The Mack Printing Co., Easton, Pa.

Intended as a guide to parents, and to young men who might be choosing engineering as a career, this book, edited by a committee headed by Dr. J. A. L. Waddell, internationally known bridge engineer, is intended to give the prospective student an insight into the sort of mentality, aptitude, and training required in the various branches of engineering so the student may judge with some degree of wisdom the extent to which he is "cut out" to be a structural engineer, an agricultural engineer, a designer of dams or other masonry structures, a surveyor, a consultant, or to fill some other niche in the engineering world.

The book contains 60 chapters dealing with various phases and aspects of the engineering profession, all written by recognized authorities in their fields. A comprehensive index is also included.

REPORT OF OXYACETYLENE COMMITTEE. Presented at 1933 convention of International Acetylene Association. 6x9 in.; 106 pages; illustrated. Published by the International Acetylene Association, 30 East 42nd St., New York, N. Y.

This year's report of the Oxyacetylene Committee is essentially a text-book or reference work on gas welding and cutting. Ferrous and non-ferrous metals and alloys are discussed separately as regards the application of the oxyacetylene process to welding and cutting. One of the most valuable features of the report is the charts and diagrams. Supplementary information includes instructions on the use of welding symbols; specifications of the A.S.T.M., A.S.M.E., S.A.E., and U.S. Navy; and code requirements.

LA SOUDO-BRASURE OXY-ACETYLENIQUE DES METAUX ET ALLIAGES. 5¼x8¼ in.; 126 pages; 117 illustrations. Paper binding; price, 10 francs. Published by Office Central de la Soudure Autogène, 32 Bd. de la Chapelle, Paris, France.

This work on brazing by the oxyacetylene process consists of two parts. The first treats of the various methods of soldering and brazing, and includes a physio-chemical study of the process applied to various materials. The second part describes the brazing of different metals and the application of the process to malleable steel, cast steel, galvanized and tinned parts, gray cast iron, malleable and special irons, copper, brasses, bronze, and various other alloys.

Side-Lights on the National Metal Show

By AN OBSERVER

The highest guess reported on production work at the Rego booth was 176,000 plus. This must have come from a time-study expert at one of those high-pressure auto plants.

• • •

An inexpensive one-sheet directory of all exhibitors and booth numbers, and also aisle markers giving booth numbers, would materially assist visitors looking for certain manufacturers' exhibits.

• • •

For years I have contended that carbon-arc welding was not being given proper publicity and the consideration due it by the welding field. Hence I was agreeably surprised to find four exhibitors—American Brass Co., Harnischfeger, Lincoln, and Hobart—expounding the merits of the carbon electrode. Mighty handy method to have around most shops.

• • •

Couldn't the "purity of oxygen" question be put across nicely by showing an oxygen tent coupled up with a tank and a sign reading "Same pure oxygen for your torch as is used in hospitals"?

• • •

Action seems to be the keynote of those attending these expositions, and experience teaches that visitors come to see rather than to hear. Yet one manufacturer who ordinarily has a live exhibit on the subject of welding did not have a torch lighted. Their exhibit was not equipped to give a live demonstration on welding or cutting, according to this observer's observation, and it also appeared that their attendants had a nice, restful time.

• • •

Not an a.c. welder on display! Any visitor not acquainted with the facts would get the impression that all arc welding is d.c.

• • •

I wonder what the literature collectors do with all the paper they collect. As for *The Welding Engineer*, it is too glossy and stiff to——hm-m——

• • •

There may be those who were satisfied with the number in attendance at the A.W.S. meetings, but I feel that the high quality of the papers presented and the industrial complexion of Detroit should have resulted in a better attendance at the lecture sessions. Why not, for next year, furnish all complimentary tickets in a small 4-page folder style, one half to be a ticket to exhibits and the other half to contain a program of the papers and a suitable wording to entitle the holder to admission to any one technical session? This form would advertise the meetings as well as the exhibits and might result in a material increase in interest in A.W.S. activities.

• • •

In Detroit, where probably more resistance welding is done than in any other city, the manufacturer of resistance welding machines should be able to make some valuable contacts, it seems to me. Maybe the manufacturers think differently, for only one of them exhibited.

• • •

One visitor remarked that he had called at the booths of four welding manufacturers to get some information but the attendants seemed too busy having a reunion or preferred to remain in their comfortable seats, so he got no attention. His harsh criticism was perhaps largely unwarranted, yet it leads me to wonder if perhaps our procedure control for conventions doesn't need a little overhauling.

• • •

To my knowledge, Hobart had the first gasoline-driven portable arc welder on the floor in years, and it seemed to get a lot of attention. Why shouldn't it?—field welding is coming in fast. If you don't think so, ask the job welders around the country.

• • •

I had always thought that a vice-president had a position and didn't have to work, until I watched A. F. Davis, vice-president of The Lincoln Electric Co. Coat off, sleeves rolled up, he was about the busiest man at the show.

• • •

While on the subject of busy men, mention should be made of Emery, welding superintendent of Harnischfeger. But Emery admits he has a "job," not a "position"—that's different! He one time tried to teach me how to arc weld, and remarked that I could weld an electrode to the work quicker and stronger than anyone he had ever seen.

Progress in Organizing Welding Shops Under NRA

Organization of job welding shop and contractor groups is continuing at full speed, according to reports from various localities. Organizations are now functioning in Plainfield, N. J., Ft. Wayne, Ind., Detroit, Mich., Chicago, Ill., and in other localities which heretofore had no group organization.

The Chicago group as well as groups in Detroit and several other cities are organizing under the name of the National Association of Welding Contractors.

These groups, together with a number of others, held a meeting in the Palmer House, Chicago, on Oct. 19th to 21st, and organized a national body called the National Association of Welding Contractors, Inc., officers of which were elected as follows:

President, Dale S. Georges, Akron, Ohio; senior vice-president, A. Keogh, New York City; regional vice-presidents, A. W. Markley, of Minnesota, Walter Thomas, of Detroit, and John B. Hendrickson, of Philadelphia; treasurer, R. Michels, Covington, Ky.; and secretary, I. B. Hexter, Cleveland. The following committee was selected to formulate a Code of Fair Competition and submit it to the Association for consideration: A. Keogh, John B. Hendrickson, W. B. Boom, H. I. Gibbs, T. H. Arnold, and E. E. Pressler.

Other recent news pertains to the organizing of the Welding Contractors Association of Greater Philadelphia and Camden, who have elected officers and filed a code with the NRA.

Welding shops in northern New Jersey have organized under the name of the National Commercial Welders Association, and have formulated their ideas of fair competition into a tentative code.

Some of the welding-shop owners in Ft. Wayne, Ind., have formed an organization, according to word from Jas. McClure, of the Wayne Welding & Supply Co., Inc.

Iowa welding contractors took the first steps to form a state organization at a meeting held recently in Des Moines. Heaviest representation was from the Waterloo, Manchester, Cedar Rapids, Chariton and Des Moines districts. A permanent organization is to follow the national welding contractors' convention in Chicago.

All-Welded Automobile Transport Trailer

The arc-welded 3-car automobile transport trailer shown in the illustration was designed and fabricated by Albert A. Lehne, of the Tri-City Welding Works, Moline, Ill. There is not a rivet in the structure. The trailer is low enough to clear all bridges in Iowa, which are notoriously low in comparison with bridges in other states.

Views of All-Welded Trailer.

All-Welded Steel Boat for General Service

The illustration shows a 28-ft. runabout steel boat built of Armco plates and welded with Roebling rod. The boat is entirely arc welded, even to the all-steel cabin with steel window frames inclosing plate glass. The deck is made out of diamond floor plate, which eliminates the hazard of slipping. The boat has a beam of 8 ft. 4 in. It is powered with a 100-hp. Sea Captain Kermath motor, which gives a speed of about 15 miles per hour.

The craft was built by the Hans Hansen Welding Co., of Toledo, Ohio, for the Dunbar & Sullivan Dredging Co.,

28-Ft. Boat of Welded Armco Plates.

who will use it to haul supplies and men in connection with dredging operations on the Detroit River. Being of iron construction, the boat can be used during cold weather as long as the river is navigable. It has no rivets to work loose or leak, and the entire construction is practically the same as one piece of iron.

Trailer-Type House Has All-Welded Frame

The Bochaus Welding Co., of Newton, Kan., recently completed the construction of an all-welded frame for a complete three-room trailer-type house. The frame is of the under-slung type with the floor of the trailer but 30 in. off the ground, which affords smoother riding than the ordinary type of trailer. This "house on wheels" is equipped with running water and other modern conveniences. The tanks for the water system are welded into the corners of the frame, both at the top and bottom, thus adding strength and rigidity to the construction. Old sucker rods salvaged from a nearby oil field were used for braces in the trailer. The puller coupling has a convenient ball-and-socket arrangement, also of welded construction and of great strength. The trailer is 24 ft. long and 7 ft. wide.

Mr. Bochaus states that welded construction saved the owner of this trailer about $40 over any other type of construction, and that the job was completed in two-thirds the time required for riveted construction. Greater strength is also a feature in favor of the welded job.

Get "*H. O. T.*" on Welding

■ Edited by
H. O. T. RIDLON
Welding Consultant, Joliet, Ill.

[This section is dedicated to Better Welding and Better Welding Shops. Suggestions and criticisms are invited.]

If You Can Build It Right, Make Your Own Outfit

It is good business to buy an electric generator and build up your own gas-driven outfit if you have the knowledge and equipment to do the job right. I've seen many splendid home-built outfits. But I've also seen a great many that were lousy, because the owner lacked experience, knowledge and equipment to do a good job. As one of my very good frinds expressed it, "The damn things usually are a quarter inch to 6 in. out of line." Motors go blah! and so on. Frankly, I don't think equipment that does not function properly does the industry any good. We are all in "biz" to make the "O-doe!" So get or build equipment that will show YOU the greatest profit. If you've got equipment and knowledge to build your own welding unit CORRECTLY, hop to it—the more power to you! If you haven't, I sincely trust you find it out before it's too late.

Join Up and Profit!

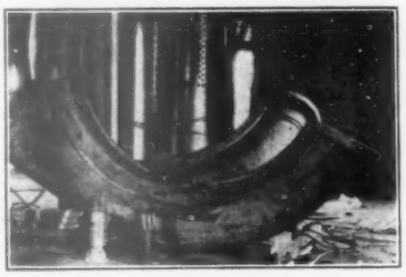
And here's the newest, hottest stuff on the National Association of Welding Contractors, Inc. It's midnight and this goes to press at dawn. All day I've sat and listened to their formation of this great organization. They're a great gang, and sure are bound to go places. And I'm proud to know 'em! And for you job-shop owners, they have done one swell job! Now take a word of wisdom from old "H.O.T."—climb on this band wagon AT ONCE. It is the salvation of the job shops. It means profit to you. You can be a member-at-large until you get a local group going. It is the organization that will put you where you belong. If you don't, you are or will be forced to do welding under the blacksmiths, steamfitters, structural iron workers, garage men, or what-not code. The welder deserves his place in the sun. You can put him there with this organization, so join up and profit.

That Big Detroit Show

Mister, it sure was swell. I'm a bit leary about writing anything 'cause maybe I'll tread on some one's toes, which I don't want to do. But I'll say a word about this and that, for I needs must be brief . . . Bastian Blessing were showing their new Rego GX Torch. It's swell—give it a look . . . Westinghouse Electric were at the Book Cadillac Hotel. . . Una were showing their new No. 2100 rod and their new automatic head. Sure looks like they really had something. . . Lincoln Electric was there with all their glory and under the command of "Pop" Davis . . Union Carbide and Carbon were also among those present . . The Grand Old Man of American Brass (Mr. Swift) was there with a swell demonstration on bronze welding. Their new phosphor bronze "D" sure proves that the job welding shop is the copper-smith of today and the future . . . Hobart were showing their Hobronze that proves the same . . . Air Reduction had a block of display. It was a swell set up, with all their dandy automatic, cutting machines Great stuff this flame machining . . And so we could go on and on about their entire show, but time and space don't permit. It was a show not to miss, for there was much that was shown that we all could learn a lot from.

Out of the Scrap Pile

The picture is a job we did last summer. It's a big impeller pump shell weighing about 9500 lb. and costing $1600 delivered to the job. Running in



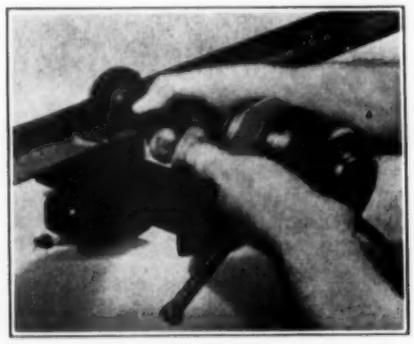
This Shell of a Big Impeller Pump Was Salvaged by Hard-Facing and Gives Better Wear Than a New Shell.

rock and sand, it lasted 163,000 cu. yd. and was shot. Just plain junk! We took high-carbon-steel blocks, about 1x2x12 in., formed to fit the contour of the shell, and welded in place and filled in between the blocks, then built up to within $\frac{1}{16}$ in. of the original shell contour with ¼ in. Stoody high-carbon welding rod, using, of course, the metallic-arc process. This consumed about 350 lb. of high-carbon rod at 12c per lb. Then we put on a layer of Stoody electric self-hardening alloy welding rod, which required 420 lb. at 50c per lb. Man and machine total 173 hours. The shell went back into service and was taken out after 300,000 cu. yd. of pumping service under the same conditions, and was quickly put back into service again by building up a few bad spots where severest wear had occurred.

New Equipment

Difficult Places Can Be Reached with New Grinder

Designed for removing excess weld metal and smoothing down welds and rough spots and edges, the "Hand-ee Hi-Power" portable grinder has been developed by the Chicago Wheel & Manufacturing Co., 1103 W. Monroe St., Chicago, Ill. With a suitable grinding wheel or cutter inserted in the chuck,



The Tool Fits the Hands Snugly.

this tool works at any angle, getting into and around corners, into irregular-shaped holes and other hard-to-reach places.

The tool weighs only three pounds and has an overall length including chuck, of only 10 in. It has a maximum speed of 17,000 r.p.m., and is powered with a universal motor that can be plugged into any 110-volt circuit. The motor housing is of heavy cast aluminum and extends out over the motor shaft, which is encased with a fully insulated cushion grip.

The entire unit comprises the grinder, three grinding wheels, a dressing stone, necessary wrenches, and a 10-ft. rubber-covered cable with soft rubber attachment plug.

Automatic Machine for Arc Welding Beer Barrels

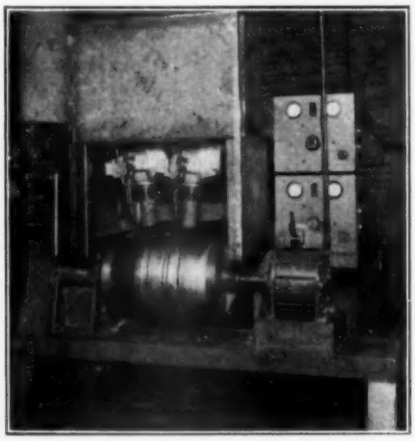
An automatic machine for welding metal beer barrels by the shielded-arc process has been announced by The Lincoln Electric Co., Cleveland, Ohio. The machine, equipped with one or two Lincoln Electronic Tornado automatic welding heads, is reported to have a production capacity of 30 barrels or more per hour, depending upon the type and size of barrel.

With barrels of the double-shell types, both the inner and outer shells are automatically welded with this machine. Some barrels are so designed that a single circumferential butt weld joins two half-shells to form a single piece of inner shell. Halves of the outer shell of barrels of this type, when placed over the inner shell, form two parallel circumferential joints with the inner shell. These are automatically welded by the machine illustrated. The design for another type of beer barrel is such that two circumferential seams welded simultaneously fabricate the inner and outer shell in a single welding operation.

Arc welded metal beer barrels are usually designed for either lap or butt welding. Almost always one edge forming the butt joint is coined. The resultant flange provides the necessary metal for the weld.

The number of automatic welding heads depends upon whether the barrels have one or two circumferential seams to be welded. When two circumferential welds in the same shell are required, both are made simultaneously with two automatic heads.

The Electronic Tornado heads are so designed that though operating simul-



Making Two Welds at One Time.

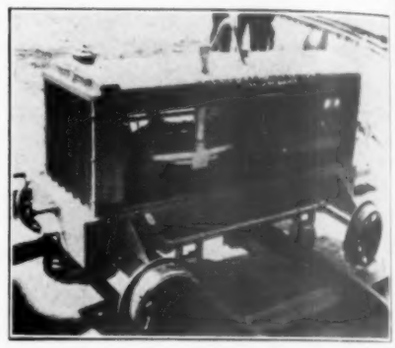
taneously within a few inches of each other, neither arc disturbs nor affects the operation of the other. The welding heads are stationary, the barrels being revolved automatically under the arc as the welding progresses.

Welds produced by this machine are made by a shielded arc, insuring weld strength greater than the shell metal and equal to it in ductility. The welds also show greater resistance to corrosion. Barrels welded by these machines have been filled with water, dropped 10 ft. and tested with air pressure, without indication of leaks.

According to latest reports from manufacturers now using this type of Lincoln automatic barrel welder, more than 8,000 barrels are being welded daily with these machines. In most installations two or more machines are attended by a single operator.

Railroad-Type Welders with Transverse Wheels

Four 300-ampere, engine-driven, railroad-type arc-welding sets, one of which is shown in the illustration, were recently built by the General Electric Co., Schenectady, N. Y., for the New York Central Railroad for building-up battered rail ends and repairing frogs and switches. The units are equipped with transverse wheels for facilitating removal of the equipment from the rails,



G-E Welder for Railroad Service.

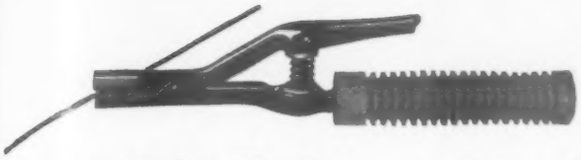
these wheels being raised and lowered by means of a hand-operated crank located on one side of the chassis. The lifting bail on the top of the unit permits the set to be handled by a work-train crane.

New Hard-Facing Rods for Gas and Arc Application

A new hard-facing material known as "Resisto-Loy," supplied as a rod for application with the oxyacetylene flame and as an electrode for applying with the electric arc, has been developed and placed on the market by The Resisto-Loy Co., Grand Rapids, Mich. This material is said to consist of various fused metallic carbides which combine great hardness with extreme toughness.

The deposited metal has a melting point of 2200° F., it is claimed, and a Rockwell C scale hardness of 59 for gas deposits and 57 for arc deposits, with a tensile strength of 89,000 and 82,000 lb. per sq. in. when deposited by the gas and arc processes, respectively.

The rod flows very easily and can be applied with a brazing torch if a suitable flux is used. It is recommended for hard-facing farm and agricultural machinery, oil-field equipment, cement-mill equipment, dipper edges, and for other applications where resistance to wear is desired. A leaflet issued by The Resisto-Loy Co. describes the procedure for applying the material.



New Dockson Electrode Holder With Heat-Resisting Jaws.

Electrode Holder Built for Long Service Life

Jaws made of a special heat-resisting alloy are one of the features of the new Dockson electrode holder, made by the C. H. Dockson Co., 2885 E. Grand Blvd., Detroit, Mich. These jaws, made from a newly developed alloy, will stand a great deal of arcing and show remarkably long life under severe service. They will grip the electrode at various angles, and good electrical contact of jaws to holder is assured by the use of hard solder.

The tension spring is insulated at both ends with fiber cups, thereby eliminating the possibility of softening or annealing the spring through accidental arcing. The baked porcelain finish reduces the likelihood of short-circuiting through any accidental contact of the holder with the work. The light-weight removable fiber handle has flange-like corrugations to increase the heat-dissipating surface, thereby resulting in an exceptionally cool and comfortable grip.

Annealing Compound for Steel-to-Cast-Iron Welds

An annealing compound, intended to be sprinkled over steel welds made on cast iron by the electric arc, to prevent checking and cracking and the occurrence of hard spots, has been developed by the Weldun Manufacturing Co., 2508 Larimer St., Denver, Colo., and is being marketed under the trade-name Weldun Annealing Compound. This product is

Annealed Cast-Iron Welds Can Be Drilled.

said to be a dry chemical compound, non-poisonous and non-explosive, nor does it deteriorate with age.

The compound is applied over the weld when it has cooled to a bright cherry-red color. Welds which have hard spots can be annealed with this compound, it is said, by heating the weld with a torch and then applying the compound over the weld. About 15 minutes should be allowed before attempting to machine or drill the weld. An increase in ultimate tensile strength and a considerable reduction in hardness are claimed, based on laboratory tests.

New Rego GX Torch Has Many Features of Design

The new Rego GX torch, demonstrated publicly for the first time at the National Metal Exposition held recently in Detroit, is characterized by its light weight and wide range of application. No tubes or soldered joints are used in the torch, and the streamlined gas passages, together with the Rego system of mixing, results in a very soft welding flame with a long cone which when concentrated on the weld allows fast welding with but small loss through heat diffusion, it is claimed.

As an example of the flexibility of this torch, it is being used efficiently with tip sizes ranging all the way from No. 20 to No. 72—good for work on the

Light-Weight Torch Built to Handle Wide Variety of Jobs.

heaviest casting or on light sheet metal. Moreover, the GXK cutting attachment available with the torch is said to have a capacity range from 1/16 in. up to 8 in. of iron or steel. The torch and cutting attachment resist flash-back even under the most extreme conditions, it is claimed.

The handle is a solid unit of ribbed design, the gas passages being a part of it, with no tubes used. It is made of a new alloy stronger than mild steel and light in weight. The rear valve body, containing both the oxygen and acetylene valves, are made of the same material. The valve wheels are splined and riveted to monel metal stems.

Monel metal is also used for the torch head, resulting in a strong construction that eliminates the likelihood of stripped threads or damaged seats. All joints have accurately machined seats and do not depend upon threads or solder for tightness. The tip and tip end are of pure hard-drawn copper, and each tip has its individual mixer.

The gases are made to flow easily and turbulence is prevented by making the surface of gas passages smooth and using a large-radius gooseneck bend in the tip. The hole in the tip end is burnished to a mirror-like surface. The long, soft cone is conserving of gases and the torch can be operated at such low pressures as to use virtually all the "good gas" in both acetylene and oxygen cylinders. Wide variations in pressure do not affect the efficiency, it is claimed.

The construction is such as to give good balance, which combined with light-weight, well-proportioned parts results in a torch that can be handled for many hours steady without inducing fatigue.

Information on further features of design and on gas consumption can be obtained from the manufacturers, The Bastian-Blessing Co., 240 E. Ontario St., Chicago, Ill.

Machine for Making Extruded Coatings

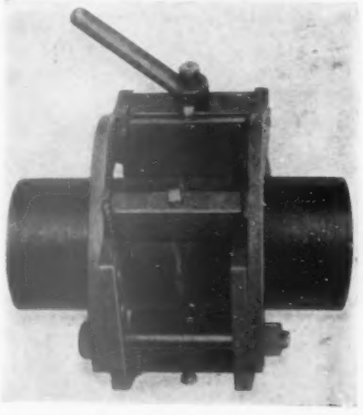
The latest type of extruding machine developed by the Electric Arc Cutting & Welding Co., Newark, N. J., is shown

Machine for Coating Electrodes.

in the illustration. Its operation is entirely automatic. "S" and "C" rods are fed into a hopper and complete covered rods are delivered at the other end. The machine is sold with licenses to manufacturers. Twenty-two firms are already licensed under the patents of this company for the manufacture of rods with extruded coatings.

New Clamp Makes Pipe Welding Easy

The "Bull Dog" adjustable welding clamp automatically centers the pipe in the correct position for welding and is easy to put on and take off because of



Showing Application of Pipe Clamp.

its one-lever control, states Oster-Williams, 2057 East 61st Place, Cleveland, Ohio, manufacturers of the clamp. At present this clamp is made in two sizes, one being adjustable for pipe from 4 to 6 in. in diameter, and the other for 8-in. to 12-in. pipe. The smaller tool weighs 18 lb. and the larger 26 lb. The open construction of the clamp leaves plenty of space for tacking. The heavy, welded steel frame will withstand a great deal of abuse.

Trade Literature

Many types of products made of "IngOclad" steel, which is a mild-steel plate with a stainless surface on one side, are shown in a folder issued by Ingersoll Steel & Disc Co., 310 S. Michigan Ave., Chicago, Ill.

An automatic arc-welding head of the all-electric type is described in bulletin No. 142, issued by Una Welding, Inc., Cleveland, Ohio. Description of the two-motor drive and control panel is given and a schematic wiring diagram is shown.

Tank heads of pressed steel, including oval heads of four different types for basement tanks, double dished heads for oil storage tanks, and shallow dished heads, as well as manholes with covers, are described and dimensions given in a new bulletin from the Lukens Steel Co., Coatesville, Pa.

The P&H Hansen Arc Torch, for welding copper and aluminum and for brazing cast iron and non-ferrous metals by the electric arc, is described and samples of brazing and welding are shown in a bulletin issued by the Harnischfeger Corp., 4513 W. National Ave., Milwaukee, Wis.

"Copper and Everdur for Brewing Equipment" is the title of an illustrated pamphlet published by The American Brass Co., Waterbury, Conn. Included is a report of results obtained by Schwartz Laboratories, Inc., showing that copper and Everdur have no detrimental effect on beer, yeast and fermenting wort.

"The Metallizer" is the name of a publication which made its first appearance with the October, 1933, issue. It is devoted to the promotion of metal spraying and the technique and possibilities of the process. Copies can be obtained from the Metallizing Engineer Publishing Co., 303 East Fourth Street, Los Angeles, Calif.

"Welding of Genuine Wrought Iron" is the title of a booklet issued by the A. M. Byers Co., Pittsburgh, Pa. The procedure is described for welding by both gas and electric arc. Chemical and physical properties are discussed. A.S.T.M. specifications are given as well as sizes of welding fittings. A number of wrought-iron installations made by welding are illustrated.

Welding rods of more than 65 distinct types for electric-arc or oxyacetylene welding are described in the recent edition of the "Swedox" welding wire

New Welding Wire Catalog of Central Steel & Wire Co.

and accessory catalog, copies of which can be obtained from the Central Steel & Wire Co., Dept. W. E. 1033, 4545 S. Western Blvd., Chicago, Ill. A complete line of accessories is also included. Capacity of carbon electrodes, sizes and weights of welding rods, current requirements for various sizes of rod, recommendations as to the correct size of rod for different thicknesses of metal, specifications of alloy steels, wire gages, etc., are given in tabular form. An offer is made to furnish free samples of welding wire for any specific kind and size of metal to be welded.

"Adams" arc-welding electrodes and welding supplies are listed and described in a booklet issued by the J. D. Adams Co., Welding Division, Indianapolis, Ind. Included are "High Ductility" electrodes (brown coating), "Tank Craft" electrodes (reversed polarity), "High Arc Stability" electrodes (white coating), "High Tensile Strength" electrodes (pink coating) and uncoated electrodes. Specimens subjected to tensile and bend tests and to acid tests are shown.

"At last—automatically maintained pressure regulation" is the title of a folder describing the new Airco 2-stage-reduction oxygen and acetylene regulators. Fifteen outstanding features of these regulators are listed and the construction is clearly shown by sectional diagrams. Particular emphasis is laid on the constant delivery pressure maintained with these regulators even with a large drop in cylinder pressure. Copies of the folder may be obtained from the Air Reduction Sales Co., 60 East 42nd St., New York, N. Y.

Price List 404 on Tube-Turns and other welding fittings, including tees, flanges, nipples, ellipsoidal heads, and reducers, was recently issued by Tube-Turns, Inc., 1300 S. Shelby St., Louisville, Ky. The advantages of Tube-Turns over threaded installations are brought out by means of data on pressure loss, reduction of wall thickness by threading, and weight. Information is also given on the insulation of piping systems and on the selection of Tube-Turns of wall thicknesses that will take care of various pressure-temperature conditions.

Commercial News

Flame Cutting With City Gas

The cutting of steel with oxygen and city gas was demonstrated in the booth of the Weldit Acetylene Co., of Detroit, at the National Metal Exposition held recently in that city. A Vulcan cutting head was used and steel plate up to 4 in. in thickness was cut with almost a machine finish. The Vulcan Flame Cutter, as the machine is known, is said to be able to cut up to 8 in. of steel, using manufactured city gas or natural gas. It was operated by J. B. Manor, and aroused a great deal of interest. This cutter was illustrated and described in the February, 1933, issue of *The Welding Engineer*.

Hollup Displays Their New Welder

The new Hollup "Protected Arc" welder was shown for the first time to the public at the recent National Metal

Exposition in Detroit. The all-enclosed feature of this welder aroused a great deal of comment. The Hollup space also had a welding booth in which "Sure-Weld" and other Hollup electrodes were applied with the arc supplied with current from the new Hollup welding machine.

Airco Demonstration Sets Record

What was acclaimed by many visitors as the largest demonstration of machine gas cutting they had ever seen, was the exhibit of the Air Reduction Sales Co. at the National Metal Exposition held recently in Detroit. At the large Airco booth were shown three styles of Oxygraphs, a Camograph with a magnetic roller for contacting with the templet, three Radiagraphs equipped with various attachments, and a pipe-cutting machine, all in operation. The demonstrations were spectacular and created a great deal of interest, as evidenced by the large crowds that were almost continually grouped around the Airco booth.

G. N. Sieger, formerly with the Elkonite Division of the P. R. Mallory Co., Indianapolis, Ind., has formed a company to specialize in timing controls and resistance welding electrodes. The S. M. S. Corp. (Specialized Metal Service), which is the name of the new company, is located in Detroit, Mich., in the City Pattern Works Building at 1165 Harper Ave.

Emmett K. Conneely has been appointed Manager of Railroad Sales by the Republic Steel Corp., Youngstown, Ohio. Mr. Conneely has served in various capacities with the Pittsburgh & Lake Erie Railroad, the Standard Steel Car Co., the New York Air Brake Co. and the Pullman Co.

Carter-Lockard Co., of Los Angeles, Calif., manufacturers of "Klearsite Koverglas" for electric welding hoods, and distributors of "Chambers" helmet goggles and other welding equipment in the southern California territory, has moved from 950 S. Flower St. to 225 West 11th St.

Clayton E. Larson has announced the sale of his interest in the firm of Wooldridge & Larson, Glastonbury, Conn., to R. J. Wooldridge. Mr. Larson has established offices at 56 Imlay St., Hartford, Conn.

The L. E. Myers Co. announces the removal of its offices from 20 N. Wacker Drive to Suite 1314, Monadnock Bldg., 53 W. Jackson Blvd., Chicago, Ill.

The Mossman & Yarnell Co., Fort Wayne, Ind., have been appointed distributors for the hard-facing rods made by The Resisto-Loy Co., of Grand Rapids, Mich.

Henry Maranda has been added to the sales force of the Grand Rapids Welding Supply Co., Grand Rapids, Mich.

The W. J. Holliday Co., Indianapolis, Ind., recently sold a 300-ampere diverter-pole motor-driven Hobart arc welder to the McGrath Foundry & Machine Co., at Lafayette, Ind.

The Smith Welding Equipment Corp., Minneapolis, Minn., is marketing an all-welded oilless automatic beer pump.

News From the Field

Keeping Welding Rods Dry

For storing gas welding rods in a dry place, Leo. Millard, of Whitewater, Wis., uses containers built from carbide cans. He cuts the top out of one can and the bottom out of another and then welds the two cans together at the open ends. The cans are made attractive in appearance by painting. The cardboard washer which comes with the cans is used to make the screw cap air-tight.

Embossing-Die Rolls Reclaimed by Welding

The building-up of worn surfaces saves the cost of embossing-die rolls used in manufacturing paper napkins. New rolls cost from $300 to $500, but the C. G. Bretting Manufacturing Co., of Ashland, Wis., are building up the worn bearings and threads with Lincoln welding electrodes, then machining the bearings and recutting the threads. About one hour is required to build up a roll, and $12 covers the cost of repairs, including machine work, thus resulting in a tremendous saving over the cost of a new roll.

Sprays Metal on Wood to Make Mask for Die

The metal-spray process is being put to a new and novel use by a customer of the Grand Rapids Welding Supply Co. In this case the metal is sprayed on a piece of carved wood, thus making a metal mask which is then used as a die for the making of imitation wood carvings. The conventional method of making imitation carvings is to heat a metal die and press it against wood by a hydraulic press. The making of these dies has been expensive and it is difficult to bring out fine details. Now a wooden mold is made which is the reverse of the desired carving, and it is possible by carving the wood to bring out the fine lines desired in the imitation carving. The mold is then sprayed with metal to such thickness that after the metal mask is removed from the mold it will withstand the pressure necessary to produce the imitation carvings. In addition to giving finer details, this method is said to be cheaper than the former method.

Ready to Settle Down, This Welder Chooses Sauk City

Way up in Sauk City, Wis., lives Walter Aron, who in his 11 years of welding experience has been with several large firms and worked on large jobs throughout the Middle West, South, and East. His first job was in the welding shop of Fred Schreiner, at Plain, Wis. Later he was with the A. O. Smith Corp. and the Milwaukee Forge Machine Co., both in Milwaukee. Next he went with the MacArthur Concrete Pile Corp. and was located at various times in Milwaukee, Detroit, Cincinnati, New Orleans, Bonkar, W. Va., and New York City. His health broke down and he located in Sauk City, where he bought a welding-shop building and a home and got married and settled down. Though his income is much smaller than in the days of high salaries and expenses, he says his real income is higher and he is enjoying life more than ever.

Welded Scrap Casting Brings a Good Price

Building-up a scrap casting by welding, and then selling it, is not as impossible as it might sound. The New Deal Machine & Welding Service, Madison, Wis., had on their hands a differential casting that had come out of an International truck-tractor. The main pinion bearing had become so worn that the casting was almost worthless. The worn bearing was 5¾ in. in diameter and 2¾ in. wide. About 1/16 in. was taken off the surface to get to the clean metal, and then the casting was built up with 3 lb. of Oxweld M25 bronze and then machined. One hour was required for cutting down to clean metal, 1½ hours for bronze welding, and 2 hours for machining after building-up. The casting was made as good as new and was sold to a customer who preferred to buy it rather than pay $62.50 for a new casting.

Some Scrap Material Make Good Shims

As a shim material for lining up work preparatory to welding, the Heide Hardware & Implement Co., of Jefferson, Wis., who operate a welding shop in connection with their business, have discovered that old mower sections as well as corn and grain binder sections are very useful. These parts are triangular in shape and have two sides beveled.

Recent Tank Explosions Fatal to Welders

Two deaths recently occurred among welders when tanks exploded, due to proper precautions not being taken when working on tanks containing inflammable vapors or gases.

One victim was John Schutz, proprietor of the Midway garage at Sauk City, Wis. Mr. Schutz had welded a tank onto a tar truck, and two days later when he was attempting to reweld it the tank exploded.

The other case was that of Emil Sydell, welder for the Duluth Welding & Machine Works, Inc., at Duluth, Minn., who was instantly killed when cutting up some old barrels. Mr. Sydell had been engaged in cutting up barrels for several days before the explosion occurred, and evidently he unwittingly cut into one containing an explosive mixture.

Wisconsin Shop Keeps Busy on Contract Work

Recent contracts from Janesville firms have made a busy place of the plant of F. O. Ambrose & Son, of Janesville, Wis., manufacturers of boilers, engines, tanks, smokestacks, railings, pipes and valves.

For the Bower City Beverage Co. an all-welded breeching was installed connecting a new boiler to the stack. This breeching had a 12-ft. sweep and a straight run of 32 ft. and was made of 12-gage plate.

Other recent jobs were the construction of an all-arc-welded stack and oxy-acetylene-welded breeching for the cheese factory of Casper Jaggi, and an arc-welded stack for the South Koshkonong Creamery.

A low-type trailer, constructed by L. P. Larson, job-welding-shop owner of Lake Geneva, Wis., represents an unusual job of structural welding that has stood the test of time and most severe use. This trailer is 25 ft. long and 12 ft. wide, and it weighs 8 tons. It has four wheels in the back, there being two on each side in a track, and two wheels in front. The owner, a Wisconsin road contractor, recently used the trailer to haul a 38-ton gasoline-driven drag-line excavator 90 miles overland, and the trailer showed no sign of distress.

The Cutting Engineering & Welding Works, Ltd., which until recently was located at 2213 East 38th St., Los Angeles, Calif., has been moved to 2035 East 38th St. This concern, in addition to general welding, specializes in the manufacture and repairing of rubber-manufacturing equipment, fish-canning equipment, and other industrial welding and repair work. H. Q. Cutting, owner and manager, has followed this line of work in Los Angeles for the past ten years.

O. S. Fent, owner of a welding shop at 216 East 6th St., in Newton, Kansas, who has been severely ill in a local hospital, having underwent several operations in recent months, is reported somewhat improved. Mr. Fent is an old-timer in the welding industry, having followed this work for over 16 years. George Wilkins, who has been associated with Mr. Fent in this work for nearly 15 years, is managing the shop in Mr. Fent's absence.

The Springfield Metallic Casket Co., of Springfield, Ohio, is reported to be the first concern to make both 10- and 12-gage copper grave vaults. The outside of the seam is copper welded with the carbon arc and the inside is welded with Sil-Fos brazing alloy, also applied with the carbon arc. The time is approximately 30 minutes to each vault, and the work is done with a 300-ampere 40-volt Hobart welder.

A contract for repairing the 36-in. main supply line for the waterworks department of the city of Elyria, Ohio, has been awarded the Lorain Welding Co., of Lorain, Ohio. Due to electrolysis, this line has become badly pitted, many of these pits extending almost through the pipe wall. These spots will be built up by arc welding, and the work has to be done without interrupting the service.

A new floor is being laid for the Plymouth Ave. bridge in Minneapolis, Minn. Heavy I-beams are used for stringers, and on these are laid inverted 3-in. T-bars, onto which is poured the concrete. The work is being done by the Imperial Welding & Manufacturing Co., of Minneapolis, who are using three Westinghouse welding machines and two shifts of welding operators.

Mr. Gilbert L. Yetter, formerly materials engineer in the Bureau of Construction and Repair, Navy Department, has been appointed welding engineer for the Bureau of Reclamation, Department of the Interior, assigned to the Boulder Canyon project. Mr. Yetter is supervising the inspection of the fabrication of the welded steel penstocks being manufactured for the project.

"Tex" Hensley, of Los Angeles, Calif., formerly a partner in the Owl Welding Works, which ceased operations several months ago, has sold his welding equipment to the Griffith Co., a Los Angeles contracting firm. Mr. Hensley has accepted an employment arrangement with the Griffith Co., whereby he will handle the welding and maintenance work on the company's equipment.

P. L. Greenwalt, of the Greenwalt Welding & Machine Works, Winfield, Kan., is rebuilding his portable electric welding unit by replacing the old 4-cylinder motor with a 6-cylinder Kissel motor. By installing a cooling fan on the drive shaft between the motor and the generator, he keeps the generator cool while in operation on long jobs of heavy work.

J. W. McCartney, welding instructor for the Frank Wiggins Trade School, Los Angeles, Calif., reports an enrollment in his department of approximately 50 welding students for the fall term. These are divided about equally between the morning and afternoon classes. The courses include training in both oxyacetylene and electric welding.

A contract for welding a steam vapor stack for a beer cooker for the Peoples Brewing Co., Oshkosh, Wis., has been awarded the Enterprise Welding & Copper Work Co., 413 Seventh St., Oshkosh, of which K. and P. Reschenberg are proprietors. The stack will be 52 ft. high, 2 ft. in diameter, and constructed of Armco wrought-iron sheets.

To come within the lengths of articulated truck-trailers prescribed by state regulations, P. T. Emley, job-shop owner of Huntington, Ind., recently rebuilt a single-deck 3-car auto carrier into a double-deck type, with the same car capacity, which shortened the length of the carrier by 20 ft. and at the same time reduced the height by 1 ft.

The American National Co., Toledo, Ohio, who have a G-E constant-potential 750-ampere arc-welding set, have purchased another outlet station, making a total of 6 outlet units. Each station consists of one reactor and one resister. The unit was obtained from the Menna Welding Co., of Toledo, G-E distributor in northwestern Ohio.

A. W. Earl, welding and blacksmith shop owner formerly located at 3929 Gage Ave., in Bell, Calif., has moved his

equipment to 6235 Atlantic Blvd. Mr. Earl recently suffered a broken leg while welding a car trailer, but is now able to be back at work. A new Model 6 "Red Head" portable acetylene generator was recently installed in his shop.

H. H. Cockrum, of Los Angeles, Calif., owner and operator of the Cockrum Welding Service, has moved his shop from 490 San Fernando Road to a new location at 400 West Avenue 26. The new quarters, which are modern in every respect, comprise a new building 40x70 ft. with side driveway leading to a large work yard in the rear.

The Arco Welding Works, of 3815 S. Main St., Los Angeles, Calif., which for several months has been under the management of J. C. Dewey, recently was reorganized by Mr. Dewey's acquiring H. J. Larison as a partner in the business. Mr. Larison was formerly associated with the Dewey Welding Works in Huntington Park.

V. C. Halberg, of the Victor Welding Works, 2906 S. Main St., Los Angeles, Calif., recently acquired the interest of his partner, George Barnes, and will continue to operate the shop under the same name, featuring car-starter-teeth work and general job welding. Mr. Halberg has been in the welding business for twelve years.

The Western Welding Works, of Los Angeles, Calif., recently moved from 1034 Long Beach Blvd. to new and larger quarters at 749 East 15th St. M. McClanahan, owner, specializes in the manufacture of boilers and tanks, and is a member of the Metal Trades Manufacturing Association of California.

Geo. Barnes, of Los Angeles, Calif., recently associated with the Victor Welding Works on South Main St., has opened a car-starter-teeth and job welding shop at 616 W. Jefferson Blvd., under the name of the Flywheel Welding Works. He guarantees each car-starter-teeth repair job for one year.

The Wayne Welding & Supply Co., of Fort Wayne, Ind., have added a 300-ampere Hobart portable arc welder to their shop equipment. This unit is powered with both a 220/440-volt motor and with a gasoline engine. Only a few seconds is required to change over from either type of power to the other.

C. W. Anderson, of Wichita, Kan., operating the O. K. Welding Works at 3055 North Lawrence Ave., recently acquired the full control of the shop by taking over a silent partner's interest in the business. Mr. Anderson will continue to feature general welding and auto and truck body and trailer building.

The installation of a smokestack breeching, connecting two boilers into one chimney, for the Hillsboro Brewing Co. plant at Hillsboro, Wis., was recently completed by the Juneau Boiler Works, Juneau, Wis. The job involved 8000 lb. of 10-gage blue annealed sheets and was entirely arc welded.

A new welding and automotive repair shop recently opened for business at 937 E. Garvey Ave., in Monterey Park, Calif. The new shop will be known as the Blanchard Garage & Welding Works. Mr. Blanchard, the owner, formerly operated a welding shop in the Lucerne Valley near Victorville.

A contract to cut up nine boilers into charging-box size has been awarded Vernon Schmidt, of Portland, Ind., by a local concern. Mr. Schmidt was recently the victim of a painful accident, in which he was severely burned on the face and hands while gas welding a Buick timing case.

A new oil-field welding shop known as the Welding Specialty Co. recently opened for business on Gladewater Road in the East Texas oil field north of Kilgore. The new shop is under the management of A. R. Grogan and E. F. Fore. Mr. Fore formerly operated a welding shop in Houston.

G. W. Moore, of Gladewater, Texas, formerly associated with the Wheeler Welding & Boiler Works, recently opened a new job welding shop on the highway between Longview and Gladewater, which is in the East Texas oil field. Mr. Moore has been in the welding business for over 18 years.

Walter W. Trout, oldest son of W. C. Trout, president of the Lufkin Foundry & Machine Company, Lufkin, Texas, large manufacturers of welded oil-field equipment, has been transferred from Tulsa, Okla., to the home office at Lufkin. D. A. Reid will succeed Mr. Trout in Tulsa.

An all-welded 54-ft. smokestack was recently completed for the Universal Clay Products Co., of Sandusky, Ohio, by the Hinkey Portable Welding & Machine Co., of Sandusky. The stack is 30 in. in diameter and consists of sections 9 ft. 6 in. in length. Butt-type joints were used.

The New Deal Machine & Welding Service, recently formed in Madison, Wis., has been dissolved. The machine department has been moved to 2022 Helena St., while the welding department is being operated in the same location as formerly, at 147 S. Butler St., in charge of C. H. Sechrest, formerly of the Wisconsin Foundry & Machine Co.

The Capistrano Welding & Repair Shop, San Juan Capistrano, Calif., recently opened for business under the partnership of Fred Bozell and W. G. Hill. Mr. Bozell recently moved to California from Nebraska, where he was engaged in the farm implement business.

A. Ward, formerly associated with the United Machine Works, Los Angeles, Calif., has taken over the welding department of the Rollins Manufacturing Co., at 3668 Union Pacific Ave. Tank and automotive welding, in addition to general welding of all kinds, will be handled.

The Fond du Lac Vocational School, Fond du Lac, Wis., are planning to carry on with their welding course, notwithstanding rumors to the contrary. The course consists of three nights' instruction a week during the school year. Gas welding only is taught.

Hook Brothers Welding & Machine Works, located until recently at Joinerville, Texas, has recently been moved to Turnertown, where a new and larger shop building has just been completed. Both of the locations mentioned are in the east Texas oil field.

Four tanks, 10 ft. by 2 ft. by 36 in., were recently built by the Menna Welding Co., Toledo, Ohio, to be used in chrome plating. Shielded-arc rod was used on the outside of all seams, while a special acid-resisting electrode was used on the inside.

Charles F. Lindley, of Independence, Kan., recently acquired the welding shop of F. H. Smith, deceased. This shop is being operated under the original name of The A-1 Electric Welding Co. Mr. Lindley was formerly associated with the Atlas Cement Co.

Hoffman Bros. & Govin, of Bluffton, Ind., have moved their shop directly across the street from their old location on East Perry St. They recently bought a new Hobart motor-generator arc welder from The Holliday Co., of Indianapolis, Ind.

G. E. Botts, proprietor of Botts' Welding Service, at Woodstock, Ill., recently purchased a 300-ampere Hobart generator which he has connected to a gas engine and mounted the entire unit on an automobile chassis for portable use.

The Mineral Point Welding & Machine Co. was recently opened at Mineral Point, Wis., with Priestly and

Stover as proprietors. They have a complete machine shop, oxyacetylene welding and cutting unit, and a 300-ampere arc welder mounted on a Buick truck and operated by a power take-off.

B. M. Wells, of Gladewater, Texas, proprietor of the Osage Welding & Boiler Works, recently purchased a new 300-ampere gas-driven Lincoln electric welding unit. Mr. Wells features general oil field welding and boiler work.

Among equipment which Finney Bros., Platteville, Wis., are using and which they have built themselves are a tool grinder, a 30-ton hydraulic press, a 75-ton hydraulic wheel-puller, and a serpentine shear, all made with welding.

The Midwest Tank & Softener Co., 2030 E. Johnson St., Madison, Wis., has been formed with I. B. Johnson as president and engineer, to manufacture water softeners and tanks. Their products are almost entirely arc welded.

A large contract for bridge repairs has been awarded L. F. Spiese, proprietor of the Industrial Welding Shop, Portland, Ind. The work will involve welding and cutting on approximately 20 structures in that vicinity.

The Uhlir Welding Co., of Beloit, Wis., have had a production job of welding on a new type of water-coil cleaner. They recently completed a contract for a dismantling job in which 300 ft. of 1-in. steel plate was involved.

Henry Hemmingson, of Duluth, Minn., has moved his welding shop from 1014 Tenth Ave. East to 1005 E. Superior St. His arc-welding machine, which was formerly mounted on a trailer, is now carried on a new Ford truck.

H. O. Fahl has opened a job welding and blacksmith shop in Markle, Ind. Mr. Fahl formerly operated a shop in this community which he closed when he went to work for the General Electric Co. in Fort Wayne, Ind.

John C. Novotny, of Watertown, Wis., has sold his welding and cutting equipment to the city waterworks department, who first will use it on a water-main job and then turn it over to the street department.

The Madison Machine & Engine Co., Madison, Wis., who operate a welding department, are building a new cement-block, brick-front, one-story shop at 842 E. Washington St. in that city, at an estimated cost of $2,000.

A contract for welding hinges for a new type of 3-legged camp stool called "Saddle Seat", has been awarded the Four Lakes Welding Co., of Madison, Wis., by the Capital City Pattern Works, of the same city.

A total of 74 storage tanks with a combined capacity of 21,593 barrels is being fabricated by arc welding by the Emerson-Scheuring Tank Co., of Indianapolis, Ind. J. D. Adams welding wire is used.

The Womack Boiler & Welding Works, of Kilgore, Teaxs, recently moved from their old location south of Kilgore in the east Texas oil field, to 520 Kilgore St., in Kilgore. H. R. Womack is owner of the shop.

The Carter Machine Shop, of Monroe, Wis., who have been using welding for many years, have developed and are marketing an electrically-driven cheese stirrer to be used in the manufacture of cheese.

The Merritt Tool Co., of Kilgore, Texas, recently opened a branch shop in Conroe, Texas. A. P. Merritt, manager, until recently operated shops in the Oklahoma City and Seminole (Okla.) oil fields.

B. J. Bitka, job-welding-shop proprietor of Ludington, Mich., has moved his shop building 24 ft. back from the street, thereby giving his customers plenty of parking space while waiting for jobs.

Ralph J. Thompson, proprietor of Thompson's Welding and Machine Shop, 217 N. Liberty St., Rushville, Ill., has added a Smith "Life Time" welding and cutting unit to his shop equipment.

James Frame, proprietor of the Prentice Welding Shop, Prentice, Wis., has purchased a 200-ampere Hobart welding generator which he will mount on a frame and hook up to a gasoline engine.

A new air-duct installation at the Richmond, Ind., light and power plant involves both welding and riveting. The work is being done under contract by Thos. Turner & Son, of that city.

The Watertown Machine Co., Watertown, Wis., who operate a job welding and machine shop, have added a new grinder, lathe, planer, and radial drill press to their shop equipment.

The Ben Pasker machine, blacksmith and welding shop, New Vienna, Iowa, was a total loss in a recent blaze that destroyed machinery and tools. Plans for rebuilding are under way.

Instead of listing all the kinds of jobs he is called on to do, Tom Jolley, of Jolley's Welding Shop, Oskaloosa, Iowa, tells about these jobs in poetic style on the back of his business card.

Two 300,000-volt General Electric X-ray units have been purchased by The Babcock & Wilcox Co., Barberton, Ohio. One unit is for use at Boulder Dam and the other at Gauley, W. Va.

Myron Blodgett recently organized The Metallizing & Engineering Co., Inc., at 330 E. Superior St., Duluth, Minn. He will specialize in arc and gas welding and in metal spraying.

The Acetylene Welding Works, Sidney, Ohio, of which W. H. Phillips is proprietor, are devoting some of their time to the welding up of torn places in steel wheelbarrow trays.

A battery of arc-welded tanks is being constructed by the Kenny Boiler & Manufacturing Co., of St. Paul, Minn., for the Remmler Brewing Co., Red Wing, Minn.

J. J. Gresch, of the Gresch Electric Co., Beaver Dam, Wis., is planning to discontinue his electric department and devote all his attention to his welding business.

Paul M. Smith, formerly of the Industrial Welding & Engineering Co., of Minneapolis, Minn., is now connected with the Weld-Rite Co., of the same city.

The Miller Welding Co., Toledo, Ohio, recently added another truck to their equipment, on which they will mount a gas-engine-driven arc-welding unit.

Meyer & Steuber, Red Wing, Minn., have added a complete Oxweld welding and cutting unit with low-pressure generator to their shop equipment.

Fred Scherbach, who formerly operated his own welding shop in Holland, Mich., is now located with the IXL Machine Shop in the same city.

The Lima Electric Welders, 512 S. Baxter St., Lima, Ohio, have rebuilt their shop and portable arc welder, which were recently destroyed by fire.

The Geneseo Welding Shop, Geneseo, Ill., has purchased a "Red Head" acetylene generator and a complete Harris welding and cutting unit.

John Rahberger, formerly a shop owner of South Wayne, Wis., has opened a machine and welding shop in the town of Brodhead.

The Golliner Machine Co., Mineral Point, Wis., of which J. F. Golliner is

Is Tobin Bronze *really* a *better* welding rod?

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Other reasons are its low melting point (1625° F); its free-flowing qualities; the fact that pre-heating is seldom required, and that it makes dense, tough welds. Tobin Bronze and all *other* Anaconda Welding Rods are promptly available through leading distributors...usually shipped in bulk, but also obtainable in clearly labeled 10-pound packages. For additional information, ask for Publication B-13, mailed on request.

There is a suitable Anaconda Filler Rod for every bronze-welding purpose. Principal Anaconda Welding Rods, with their melting points, are listed below:

for oxy-acetylene welding

Tobin Bronze*	1625° F
Manganese Bronze	1598° F
Brazing Metal	1634° F
Electrolytic Copper	1981° F
Silicon Copper	1981° F
Phosphor Bronze	1922° F
Everdur*	1866° F

for arc welding

Silicon Copper	1981° F
Phosphor Bronze	1922° F
Everdur*	1866° F

*Reg. U. S. Pat. Off.

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proprietor, is building an addition in which will be housed the boiler shop.

Hans Nell, welder for the Otto Biefield Co., Watertown, Wis., is vacationing in Europe, and is expected back before many weeks.

H. H. Michaels, of Waupon, Wis., whose welding shop and garage burned down, has rebuilt and his place is again open for business.

M. J. MacSwain, formerly manager of the MacSwain Erickson Welding Co., Rockford, Ill., has returned to that concern as manager.

A new welding and repair shop was recently opened for business at 635 East Garvey Ave., in Monterey Park, Calif., with M. W. Brown as proprietor.

The Edge Moor Iron Co., Edge Moor, Del., boiler manufacturers, recently installed a 300,000-volt General Electric X-ray unit.

The Toledo Welding Co., Toledo, Ohio, have been appointed as agents for the Caravan Auto Trailer Co., Detroit, Mich.

Walter Stern, formerly of Milwaukee, has opened a job welding shop and garage in Waupon, Wis.

The Stow & Davis Co., Grand Rapids, Mich., have purchased a "Metallizing" unit from The Grand Rapids Welding Supply Co., of that city.

The Olsen Welding & Supply Co., Rockford, Ill., are adding a complete plating department.

Rougk Bros., Sheldon, Ill., have bought a 200-ampere gas-driven Hobart arc welder.

The All-Weld Co. Ltd., Toronto, Canada, have purchased two Metallizing units.

Klement Bros., Fort Atkinson, Wis., recently installed an Airco welding unit.

Francis Anfinson has opened a job welding shop in Geneva, Ill.

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Help Wanted—75c per line, minimum 4 lines. Jobs Wanted—4 lines free. Other Ads—$1.00 per line, minimum 4 lines. Count 8 words to line. Add 6 words for keyed address.

WANTED TO BUY

Wanted to Buy—Second-hand electric arc welder. Rempe Co., 340 N. Sacramento Blvd., Chicago, Ill.

Wanted to Buy—Arc Welder, state make, price, etc. Metal Spray Gun, in good condition. Write fully. Address Box 119, The Welding Engineer.

FOR SALE

Bargain—Two automatic welding heads and equipment, late model. Rotating machine and lathe for building and turning mine motor wheels. H. R. Colwell, 602 N. McKean St., Kittanning, Pa.

For Sale—Slightly damaged copies of "Manual of Electric Arc Welding," by Hubert, for $1.00 each while they last. Covers are a bit spotted from water. Electric Arc Cutting & Welding Co., Newark, N. J.

For Sale—200-amp. Lincoln welder on truck, a. c. motor drive; 300-amp. Lincoln welder driven by 6-cylinder Buda engine. Many others in stock. Goodman Electric Machinery Co., 1060 Broad St., Newark, N. J.

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Competitive tests show that the Smith-Waters Welders can save as much as 50% in operating costs. The stable arc assures constant deposition of weld metal, and sound welds. No moving parts. Two-year guarantee.

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FOR SALE

For Sale—Carbic Generator and Oxweld W-17 welding and cutting outfit. Used three months. Price $55.00. N. S. Miller, 528 Camp St., Harrisburg, Pa.

Bargains—Demonstrator Arc Welders. Gasoline, electric drive, belted, or coupled-together outfits. 30 days' trial. Easy terms, if desired. Write Ken's Welding Exchange, Box U-103, Troy, Ohio.

For Sale—Arc Welders, gasoline or electric driven. Spot Welders. Overhauled. Guaranteed. Attractively priced. Dealer correspondence invited. Electric Power Motors, Inc., 1087 East 97th St., Cleveland, Ohio.

Standardized Cutting and Welding Tips, interchangeable with various types of torches; also apparatus, accessories and complete outfits. Priced right. High quality and workmanship. Write for catalog. The Alexander Milburn Company selling on behalf of TIPS, INC., 1416-18 W. Baltimore St., Baltimore, Maryland.

POSITIONS OPEN

Salesmen Wanted—Side line, straight commission, calling on garages and welders. Address Box 120, The Welding Engineer.

Wanted for Australia—Competent welding operator experienced automatic electric arc welding. Preferred with experience welding steel pipes 12 to 48 in. diameter and plate thickness 3/16 to 5/8 in. both DC and AC equipment. State experience fully, age and salary. Must remain in Australia several months. Address Box 118, The Welding Engineer.

POSITIONS WANTED

A-1 Maintenance Man who is a welder, auto mechanic, machinist, repairman, rebuilder, etc., wants responsible job with factory, mill, plant, etc. Can furnish own gas and electric-arc welding equipment. Intelligent American-German, sober, married, age 30. Highest references mailed on request. Will go anywhere if the job is permanent. W. Oesterle, Jr., Milmay, N. J.